

FORT FISHER STATE HISTORIC SITE

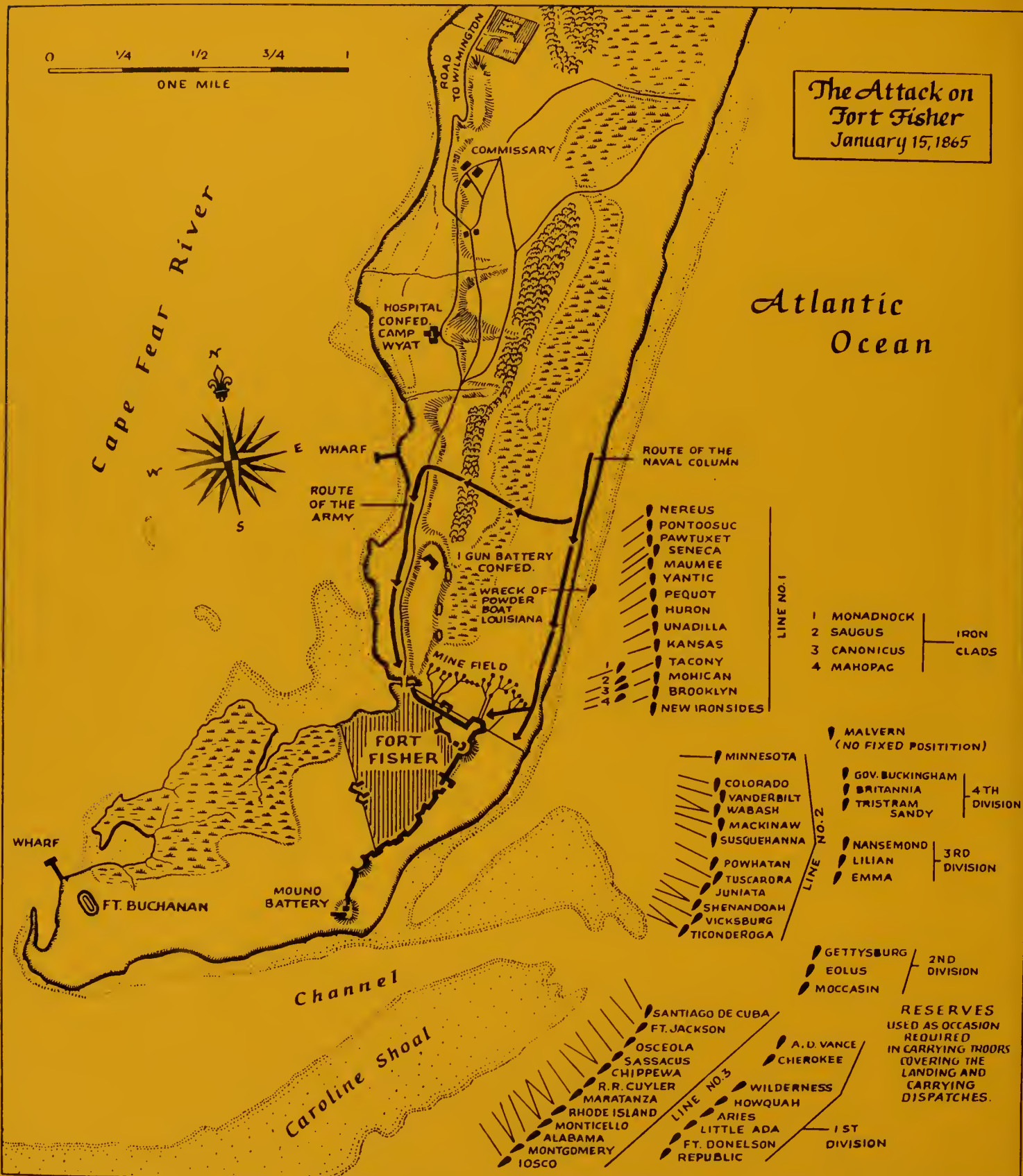
MASTER DEVELOPMENT PLAN

NORTH CAROLINA DEPARTMENT OF NATURAL AND ECONOMIC RESOURCES
AND
NORTH CAROLINA DEPARTMENT OF CULTURAL RESOURCES



The Attack on Fort Fisher January 15, 1865

Atlantic Ocean




FORT FISHER STATE HISTORIC SITE

MASTER DEVELOPMENT PLAN

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PHYSICAL CONSTRAINTS (The Problem)

In August of 1973 Secretary Grace Rohrer of the Department of Cultural Resources called a meeting with representatives of the Departments of Natural and Economic Resources, Administration, and Transportation to discuss the problems created by the uncontrolled recreational use of the Fort Fisher area. Two decisions were made at that meeting: (1) the Department of Cultural Resources was designated as the department which would have management responsibility over the area; and (2) at the suggestion of Secretary James Harrington, the staff of Natural and Economic Resources and Cultural Resources were assigned the task of writing a master plan, defining both the needs of the area and the steps necessary to bring the area under control.

Fort Fisher, located in New Hanover County at the near terminus of U.S. 421, is the most heavily visited of all the state historic sites. Developing the site only as a historic site, the Division of Archives and History, Department of Cultural Resources, is unprepared by expertise and size of staff to handle the number of visitors who come wanting active recreation. The area is used extensively for uncontrolled recreation purposes, principally swimming, fishing, camping, and motorcycle and dune buggy racing. Uncontrolled access from U.S. 421 opens the beach and marsh to motorcycle and dune buggies. Since both the basin and the shore are popular fishing areas, trails have been cut through to these areas, and the dune buggies have worsened the situation. Dunes have been destroyed by these vehicles both north and south of the revetment. Also, with the preliminary development of roads for the Ramsgate subdivision, dunes and a portion of the Fort Fisher Palisade were destroyed. This temporary road alignment only opened new routes to the beach for fishermen and dune buggies.

Fort Buchanan, at the terminus of U.S. 421, is undergoing the same kind of uncontrolled use. Motorcycles and dune buggies have cut trails through the historic site; parking occurs randomly on the site.

The most visible problems on the site are the overnight camping and the littering at the Battle Acre and at Fort Buchanan. Since camping occurs at and around the monument during the summer months, garbage collects at numerous places on the site. Fort Buchanan and the monument are the most visible areas to the public eye, with other



FORT FISHER STATE HISTORIC SITE AND RECREATION AREA



1600 800 400 0

Dune Buggies Driving
On Fort Buchanan
Ferry Route
Uncontrolled Parking
No Access Control
Unsupervised Trails

CAPE FEAR RIVER

Fort Buchanan Ferry

The Rocks

Vehicular Trunk
Uncontrolled Uses
Weak Entry Into
Museum, No
Definition

THE BASIN

BRUNSWICK CO.
NEW HANOVER CO.
Boat Access

Zekes Island

Dredging Project

Monument
Museum
Marine Science Center

Dune Buggy Access
Poor Drainage; Cut
Roads Have Des-
troyed Dunes, Exist-
ing Forest, & Fort
Fisher Remains

ATLANTIC OCEAN

LEGEND

- MARSH
- SCRUB THICKET
- GRASS
- PAVED ROAD
- UNPAVED ROAD
- BUILDING

SITE CONSTRAINTS

litter areas occurring along the beach to the south of the revetment, and in the thicket south of 421.

Yet another problem hinders the development of the site. Property within the boundaries of the site is not under one departmental jurisdiction; several departments own and administer, in many cases, conflicting or competing policies.

The Office of Water and Air Resources owns a ten-acre parcel at the northern-most boundary of the site. It has deeded 6.9 acres of that parcel over to the Division of State Highways. To date, no development has taken place on the land. Immediately south of this parcel, the Division of Archives and History owns a 15-acre parcel. The revetment project was constructed on the beach front of this parcel to protect the monument from the beach erosion. Adjacent to this 15 acres, the state purchased 287 acres, responsibility for which was later transferred to the Department of Cultural Resources. The Division of Archives and History was given the responsibility for this parcel and for the earlier parcel that it leased from the federal government. To the west of the Sunny Point Buffer Line, the Division of Archives and History leased 187 acres, under a 25-year lease which was initiated in 1962. This parcel includes Fort Buchanan, a Civil War emplacement. East of Fort Buchanan, Wildlife Resources was granted a 4.7 acre tract of land on which a small boat launching facility was constructed in the summer of 1974. North of Fort Buchanan, the Department of Transportation operates a ferry service from the peninsula to Southport on the mainland. The last parcel under a separate jurisdiction consists of 12 acres administered by the Department of Administration for its Ocean Center. Construction of the facility was begun this year on a parcel which borders the buffer line about in the middle of the site off U.S. 421.

With the small Division of Archives and History staff presently at the site, garbage collection for the 474 acres is difficult. Law enforcement and protection are provided solely by the Highway Patrol and the Sheriff's Office. The staff at the site is also unable to perform security checks on a regular basis, especially during the evening hours, and a majority of the site is unprotected from pot hunters and the like. Fire protection for the dry thickets during the summer and fall is another problem.

HISTORY OF THE SITE

A movement to develop the site of Fort Fisher as a State or National Park originated with the local citizens of New Hanover County in the early 1930s. The movement met with little success and died completely with the onset of World War II, when the fort site once again became an active military post. After the war, the site was abandoned by the Army. A landing strip had destroyed part of the land face and 100 years of sea erosion obliterated the corner bastion and much of the sea face, leaving the visitor with little to stimulate the imagination in picturing the massive earthworks and heroic battles which occurred at Fort Fisher.

In the late 1950s local and state forces joined to revive the idea of restoring Fort Fisher. During the summer of 1960, work commenced on a 180-acre tract held by the State of North Carolina under lease from the United States Government. Underbrush was cleared from the six mounds and seven gun emplacements which lie within the leased property. The mounds have been seeded and marked with interpretive signs.

Long-range plans call for continued clearing of the site, acquiring additional land, building trails, erecting numerous markers and outdoor displays, and restoring several typical segments of the fort, such as gun mounds, underground magazines, and bomb-proofs. A pavilion to house museum displays was constructed in the fall of 1961. Several years later, a visitor center-museum of ample size for gathering groups of visitors for orientation and for exhibiting an extensive collection of Civil War relics was constructed. Included in the museum is a scale model of the fort. Funds for this building were appropriated by the 1961 General Assembly. The pavilion was moved and now houses exhibits relating to the underwater archaeology program.

REGIONAL SETTING

New Hanover County is a relatively small county of about 195 square miles. The mainland is flat and heavily forested, while extensive salt marshes line the lower Cape Fear River and Intracoastal Waterway. The coast is protected by a series of small, sandy barrier islands, some of which support resort developments.

Fort Fisher is located to the south of Wilmington at the terminus of U.S. 421. This highway is the main access to the peninsula by vehicle. An average of 5,800 cars per day travel the road through Carolina Beach, decreasing to 3,000 cars per day through Kure Beach to the south.³

The nearest population centers are Kure Beach, Wilmington Beach, and Carolina Beach, three to six miles to the north of Fort Fisher. These areas are characterized by numerous beach-front rental cottages, motels, restaurants, and entertainment arcades. Their population is highly seasonal and transient with only a few hundred year-round inhabitants. The nearest area with a stable population is the major port city of Wilmington, twenty-one miles to the north, which in 1970 had a urban cluster population of 67,148.

In 1970, New Hanover County had a resident population of 82,996 persons, eight percent of whom are in the city of Wilmington. The county population projection for 1980 is 96,700, which represents an expected average annual growth rate of 1.4 percent. Population growth in the previous decade was considerably less, amounting to an average of only .49 percent per year.

New Hanover County had a civilian work force in 1970 of over 39,000 persons with an unemployment rate of about 3 percent. Largest employment categories were manufacturing (25%) and wholesale-retail trade (18%); only 1.3 percent of the population is employed in agriculture. County per capita income in 1970 was \$2,761, compared with a statewide average of \$2,492. The major industrial developments and their associated feeder industries are located along the Cape Fear River due to ease of transportation and disposal of waste products.



NEW HANOVER COUNTY

NORTH CAROLINA



Commercial fishing and fish processing have traditionally been an integral part of the area's economy. Clams, oysters, shrimp and crabs are taken in the estuaries, and finfish are taken by trawling, seining, and trapping. In addition, there is a charter boat sport fishing industry which attracts many visitors.

The many tourist attractions in New Hanover County result in its being the most important coastal county in North Carolina with regard to tourism; total tourist expenditures in 1971 amounted to \$18.0 million. Apart from the resort beaches, the most popular tourist attractions in 1971 were: Battleship North Carolina Memorial (256,000 visitors), Orton Plantation (25,000 visitors), Blockade-Runner Museum (30,000 visitors), and Fort Fisher (123,000 visitors). The importance of the out-of-state component of the tourist industry can be indicated by the fact that, according to the records of the North Carolina State Highway Commission, one out of every four cars using the Fort Fisher ferry in 1971 was from another state. The increasing importance of tourism is reflected in the rapid rise in land values and growth of the construction industry which has taken place in the past few years.

Wilmington is one of the two deep water ports in North Carolina. In 1970 the State Port Terminal served over 700 ships and barges carrying 1,128,000 tons of cargo. This was slightly less than the activity of the other seaport at Morehead City. ⁴

The importance of the marine environment to the citizens of Wilmington and New Hanover County is apparent from the large number of ocean-related facilities and enterprises located in the area. Carolina Beach, Wilmington Beach, Kure Beach, and Fort Fisher are the major recreational attractions in the vicinity. The parks and fresh-water lakes of the surrounding counties are not considered competitive with these ocean sites because of the variation in recreation sought by the visitors. There are eighteen fishing piers extending into the ocean in Southeastern North Carolina, with four being located on the beaches below Carolina Beach. Carolina Beach also offers an amusement park, with a variety of concession games and rides. A small-boat harbor in Myrtle Grove Sound provides berths for about seventy boats, and about 800 feet of wharf length for anchorage. ⁵ In addition, a marina which will accommodate approximately sixty boats is presently being constructed at the Carolina Beach State Park. There are five privately owned camping parks and one state park camping ground in the area. A total of 366 camping sites are provided by the facilities with an average charge of four dollars per site for up to six people. Since the privately owned camping parks are operating at only 40% of their capacity during the season, provision of such facilities is seen as an unnecessary duplication by the State's Division of Parks. ⁶

Swimming, sunbathing, fishing, pleasure driving and boating, and water skiing are the recreation activities most frequently engaged in along the southeastern coast. Nature oriented activities, camping, nature walking, biking, and bird watching are of secondary importance to the area, along with historic site

ACTIVITIES

- 1 **Pleasure Driving 18.5**
- 2 **Sightseeing 10.8**
- 3 **Picnicking 5.9**
- 4 **Swimming 4.6**
- 5 **Nature Walks 4.2**
- 6 **Fishing 3.8**
- 7 **Bird Watching 3.4**
- 8 **Visiting Historic Sites 1.9**
- 9 **Camping 1.8**
- 10 **Biking 1.6**

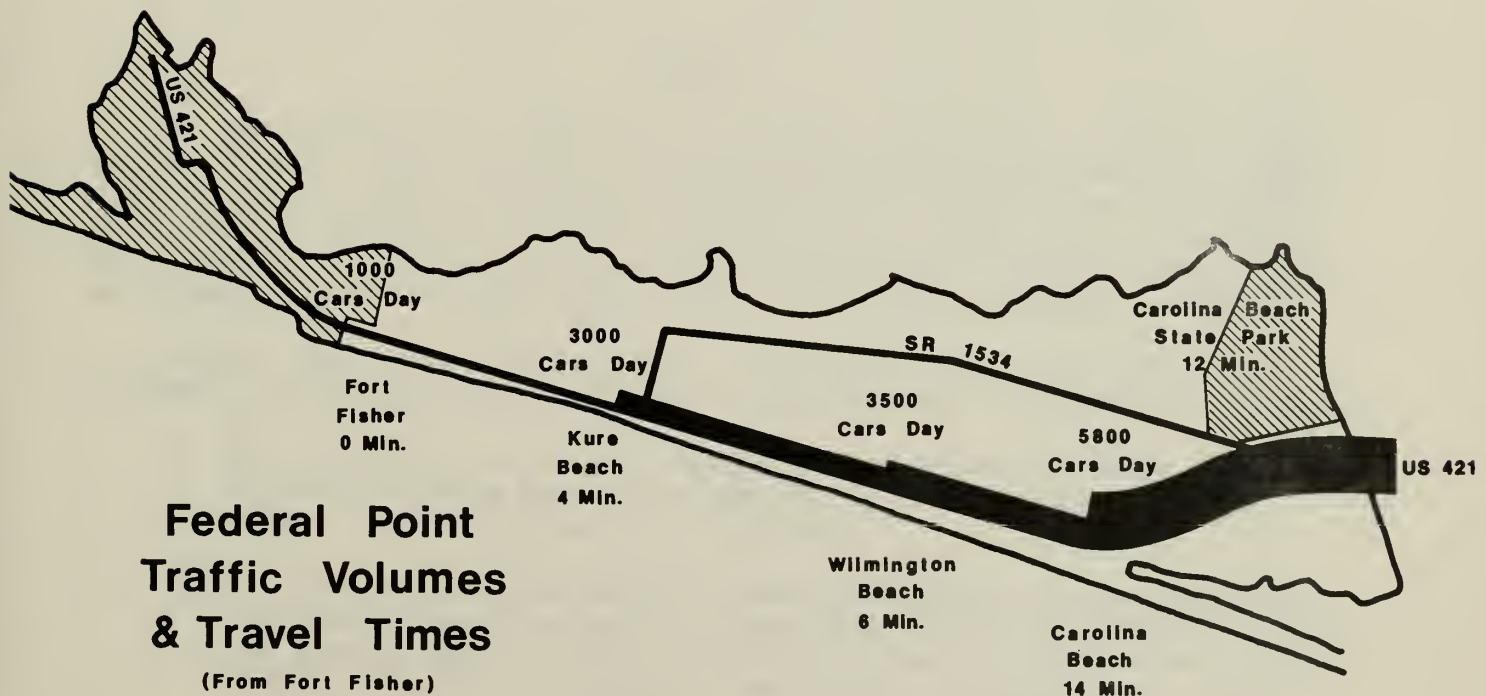


Adult Outdoor Recreation in North Carolina



**Museum Visitation
Weekends of Year 1973**

visitations.⁷ Visitation to the peninsula has been estimated to be about a million and one-half people during 1970. The Fort Fisher museum averages about a thousand people per day during the summer months.⁸ Of those visiting the museum, 30% of the people come from within a thirty-mile radius, 20% from 100 miles or less, another 20% come from between 100 and 200 miles, and the remaining 30% come from 200 miles or more. This information would indicate that visitation is equally drawn from day users, weekend users, and those staying longer; and that the area has a significant drawing capability from within and from out of the state. Carolina Beach State Park also has a similar visitation distribution except for a much heavier use from people within a thirty-mile radius (60%); thus indicating that the nature oriented activities such as walking, camping, etc., have not reached the popularity of the other activities of pleasure driving, boating, swimming, or fishing.¹



RECREATIONAL DESIGN CRITERIA

The appreciation of North Carolina history is the primary purpose for the establishment of the state historic sites. Organized sports are not considered to be activities compatible with this purpose, and facilities will not be provided.

Where the location of the site and the nature of the terrain are suitable, nature trails may be established and brochures on flora and fauna prepared for visitors. The provision of trails and the production of inexpensive booklets on flora and fauna contribute effectively to the achievement of one of the objectives of the historic sites, namely the attraction of visitors and their encouragement to stay as long as possible.

Some historic sites are now or may be in the future located some distance from established picnic grounds. Picnicking is a natural part of recreational activity today, and unnecessary disappointment and hardship would be caused visitors if picnicking facilities were not provided at sites where the nearest facilities were some miles away. In such instances the necessary facilities may be provided.

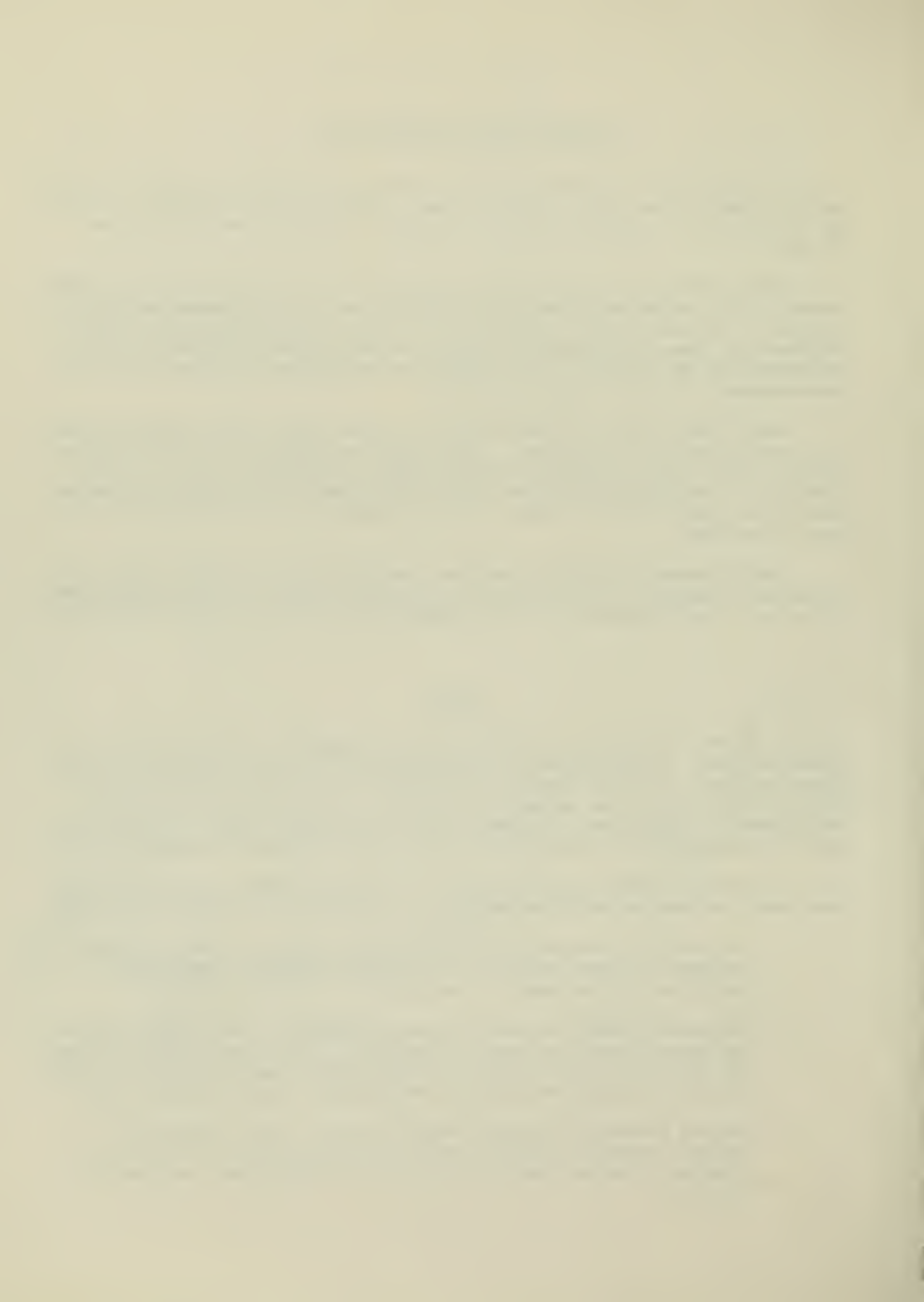
Camping presents difficult problems, and facilities for this purpose are potentially harmful to the historical environment; almost all existing historic sites are of such limited size that camping facilities should not be provided.

POLICY

It is the policy not to provide sports and camping facilities at state historic sites. Picnicking may be permitted and facilities provided at sites where no other picnic facilities are available within some miles, and where it is possible to provide suitable facilities at no effect upon the historic environment. In the case of larger sites with suitable terrain, nature trails may be established and information on local flora and fauna made available.

In addition, state historic sites and recreation areas should be planned, developed, and managed as to accommodate varying intensities and kinds of use.

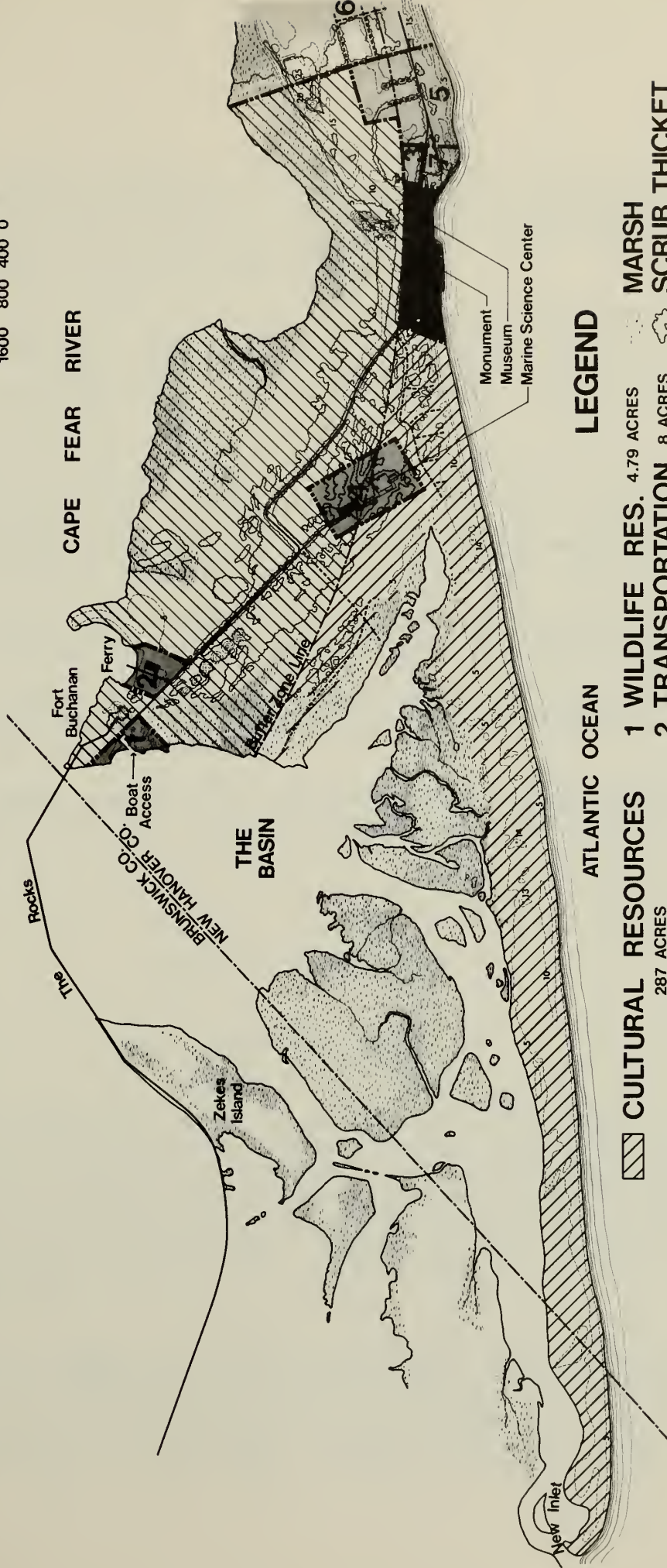
1. The use of Recreation Area facilities for organized groups should be permitted when they do not materially interfere with general public use and enjoyment of the area.
2. Resource Oriented Recreation--Outdoor recreation forms which utilize the natural resources should be provided. These may include, but are not limited to, picnicking, horseback riding, water oriented activity, climbing, hiking, and possibly environmental education facilities.
3. Special Recreation Programs--When possible, special recreation programs should be made available for public participation, such as programs to render service to youth, the handicapped, and senior citizens.



FORT FISHER STATE HISTORIC SITE AND RECREATION AREA



1600 800 400 0



LEGEND

- | | | |
|------------------|------------|---------------|
| 1 WILDLIFE RES. | 4.79 ACRES | MARSH |
| 2 TRANSPORTATION | 8 ACRES | SCRUB THICKET |
| 3 WATER & AIR | 3.1 ACRES | GRASS |
| 4 ADMINISTRATION | 12.5 ACRES | PAVED ROAD |
| 5 ORRELL | | UNPAVED ROAD |
| 6 AIR FORCE | | BUILDING |
| 7 HIGHWAY | 6.9 ACRES | |

ATLANTIC OCEAN

- | | |
|--------------------|------------|
| CULTURAL RESOURCES | 287 ACRES |
| ARCHIVES LEASED | 187 ACRES |
| ARCHIVES OWNED | 15.3 ACRES |

OWNERSHIP

4. Environmental Education and Cultural Programs--Conservation and environmental education is an essential part of the interpretive program. Cooperation with schools, colleges, and other organization is encouraged for the purpose of communicating an environmental consciousness, both within and beyond the area.
5. Information and Interpretation--Information and Interpretive programs are necessary to inform visitors of recreational opportunities available. Carried a step further, they provide a better understanding of, and appreciation for, the natural environment and assist visitors in their quest for quality outdoor recreational experiences.

Visitor centers, contact stations, and interpretive centers may be even more in demand and subject to more public utilization than in some parks or natural areas. Because of the visitor impact expected in these areas, high public attendance and involvement would make such centers almost mandatory. Typical programs would include:

- A. Information on weather, fishing, and other activities that may have significant impact on the safety or enjoyment of visitors.
- B. Programs of instruction in water safety for boaters, swimmers, scuba divers, etc., in cooperation with local groups, state and local governments.
- C. Instruction in nature study and similar programs to enhance the quality of the outdoor recreation experience for visitors.²

RECREATION JUSTIFICATION

RECREATION NEEDS

Demand for outdoor recreation activity is increasing steadily, both in the nation and in North Carolina. Population growth has been rapid during the past twenty years, and rising levels of education and income have permitted a wider choice of recreation possibilities for an increasing number of people. The growing demand for recreation opportunities has resulted in programs to acquire and develop outdoor recreation areas. Planning for these programs is based on study of the existing supply of resources and projection of future demand for outdoor recreation.

Estimates of demand for outdoor recreation are used in evaluating needs for opportunities and making plans to fill those needs. Recreation demand is related to population size--the more people, the more demand--and to the socioeconomic characteristics of the population--people of different age, sex, and income desire different types of recreation. By 1985, the state's population is expected to rise nearly twenty percent, which will mean an increase of about a million persons.

An inventory of recreation sites was made during 1967 to find out what outdoor recreation areas existed and where they were located. Only those areas functioning mainly to provide outdoor recreation were counted. In general, the location of the 2,550 recreation sites in the state reflects North Carolina population distribution and urbanization. High-density recreation areas and facilities are predominantly located in the Piedmont where the urban population is relatively large. Natural areas, resource-oriented and privately operated recreation sites are more typical of the Coastal Plain and Appalachian regions.

Requirements for the Future

By knowing the present supply of outdoor recreation areas and projecting North Carolina population growth, based on the desirable standard, present and future needs for outdoor recreation areas can be calculated. On this basis, 213,000 additional acres of land and water for recreation purposes were needed as of 1970 to raise all regions to the standards used in this plan. This represents an increase of more than six percent in the acreage of land and water available for outdoor recreation. Between 1970 and 1985, due to projected population growth, an additional 57,000 acres of land and water will be required.

Needs for BOR Class III, Natural Areas, account for more than three-fourths of total acreage needed in 1970. The 167,000 additional acres needed represent an eleven percent increase in available Class III acreage in the state. Needs exist in 73 counties in the state.

The distribution of sites is as important to consider as total acreage. Unique, primitive, and historic sites must be developed where they naturally exist, but location of other classes of sites should be made in response to population concentrations. Class III, Natural Areas, presently exist primarily in Appalachia; acquisition of additional such areas in the Coastal Plain and Piedmont is needed to add to the variety of recreation opportunities available in those regions. ¹

Acquisition and Development

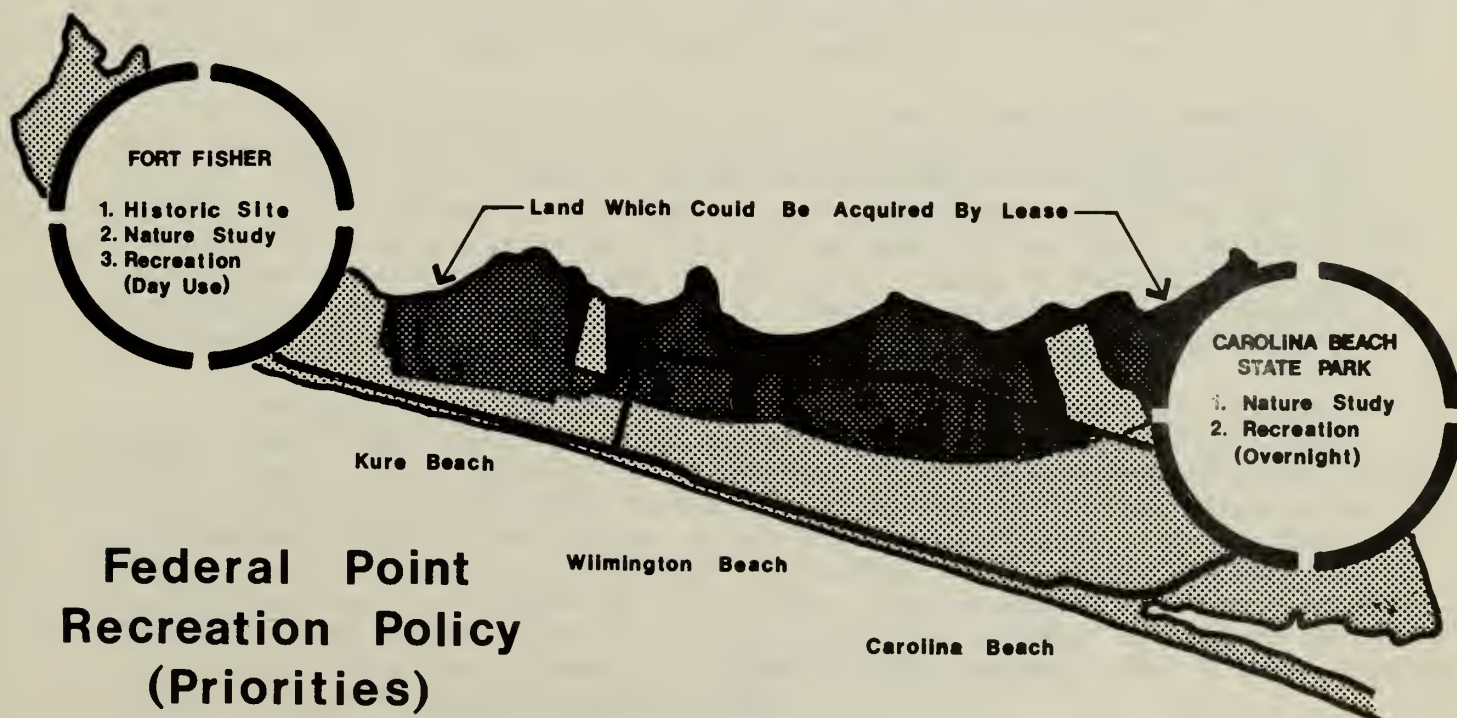
The state has developed a five-year action program to meet outdoor recreation needs. Individual projects are assigned priorities for funding on the basis of their expected contribution to meeting the top priority needs identified in the State Comprehensive Outdoor Recreation Plan. From 1970 to 1974, 244,000 acres of recreation land and water is scheduled for acquisition based upon the needs described. Of this total, 28,000 acres is to be acquired by state and local governments; the remainder is proposed by the federal government.

Although this schedule will more than satisfy present needs in one region and land class, there will still be needs for more land in the remaining regions and classes as of 1974. Considering that land and water needs have been calculated for the first time in this plan, it is understandable that all needs cannot be fully satisfied in five years. Nevertheless, identifying needs by class and region will affect the acquisition program as it is revised in coming years.

Scheduled acquisition varies widely among regions and classes. For BOR Class I areas, acquisitions, with emphasis upon urban areas, are expected to meet one-sixth of identified needs with the Piedmont having the largest remaining needs. Class I area acquisitions will meet about one-half of identified needs, with the Piedmont again showing the largest amount of needs still to be met. Class III scheduled acquisitions will more than meet projected needs if federal projects in the Coastal Plain are carried out.¹

Fort Fisher falls under two classes, III and IV. Established as a state historic site in 1960, additional land was purchased by the state in 1968 principally to protect the historic property (Class VI) and also to provide outdoor recreation (Class III). Relying on the natural features of the area and the historic site to provide recreation activities, the recreation area was conceived as part of the development proposal provided in the outdoor recreation plan. Of the total budget for the coastal plains region for 1970-1974, thirty-six percent was to be used for site development.

Development of coastal recreation facilities for the area includes the acquisition and development of Carolina Beach State Park along with the development of recreational facilities at Fort Fisher. The two facilities are to complement each other in the provision of activities and facilities. Fort Fisher is to be first and foremost a historic site, with complementary recreation and nature programs provided. Carolina Beach State Park is to be primarily a nature study and recreation area.²



PHYSIOGRAPHY OF FORT FISHER

THEORY OF DEVELOPMENT OF ISLAND

Neither the time nor the manner of the formation of Federal Point is clearly understood. There have been no extensive geological studies, but some indications are of interest.

Accordingly, Federal Point would have come about in the following manner. Northeast winds during the fall and winter moved sand southward along the eastern coastline, building a sand spit at the point where the coast turned westward. Southerly winds, which dominate southeastern North Carolina during the spring months, pushed sand at the end of the spit back upon itself, bending the point of the spit to the southwest.

At times northerly winds dominated. During these periods the eastern beach would have grown larger as sand accumulated at its southern end. However, long periods of dominant southerly winds would have resulted in the formation of the westward reaching arms.

Sand Spit Formation

Such action is well defined by geologists as being a major way that offshore islands of this type are formed. It may have happened here. Further work is certainly needed to establish this as fact and there are alternate theories. If Federal Point were formed in the preceding manner, it is of recent origin.

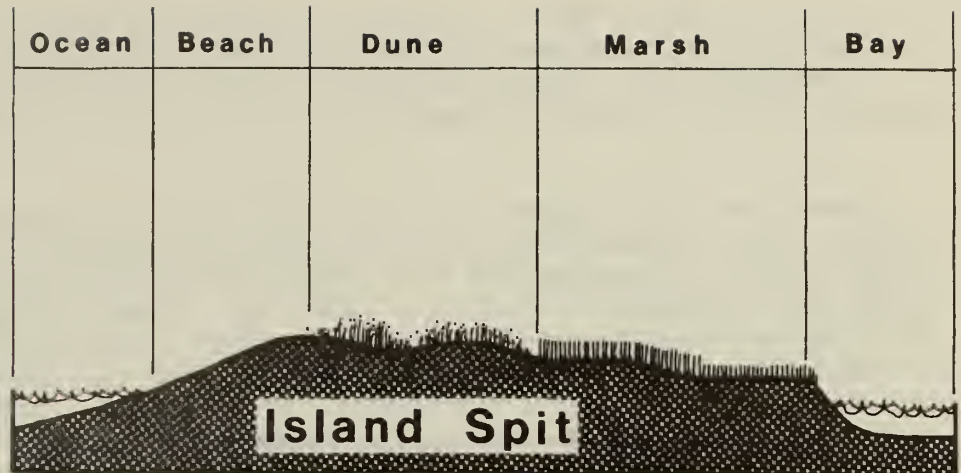
An alternate hypothesis is that this cape was formed by the deposition of river-transported sediment as the ocean's edge retreated during the glacial periods. During these times the shoreline regressed and the gradient of the Cape Fear River increased, resulting in less sedimentation along the inland portions of the river and more deposition at the mouth of the river. As the river mouth moved seaward with the lowering sea level, ridges of sediment would have extended out over the continental shelf. Thus, according to this hypothesis, the cape would have represented deltaic ridges formed during glacial periods.

As the glaciers melted and the oceans rose and reclaimed the continental shelf, these ridges would have been subject to erosion and inundation. This process was, however, apparently not uniform. There were periods of rapid rise in sea level with accompanying severe erosion of these headlands. There were also periods when the rate of rise in sea level was very slow. During these periods, wind action piled sand along the beaches, building the Cape Fear River much higher than the original deltaic ridges. This mechanism may have also projected the cape seaward from its original location. A slight subsequent increase in sea level would have flooded the lowlands to the landward side of these barrier ridges forming the present day estuaries.

Under both hypotheses, two further conditions would have broken the flow of water from the already slow moving Cape Fear River and would have increased the rate of deposition of silt in these areas. As the bays filled, cordgrass would appear along the edges of the peninsula, and in time, the marshes would have

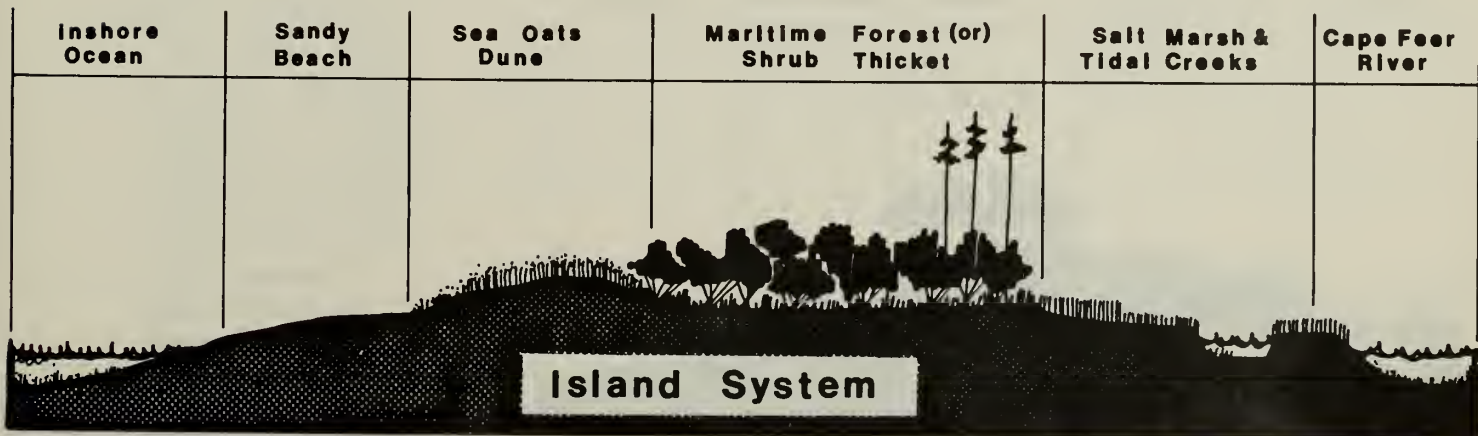
become quite extensive, broken only by the tidal creeks maintained by the scouring action of the daily rush of tide.

A second molding action obvious at Fort Fisher is the continued erosion of the east beach as littoral drift continues and as the ocean continues to rise relative to the land.



Continuing our supposition that Federal Point was formed by one of the above sets of actions, the sequence of events would have progressed something like this: As sand accumulated and dried at low tide, the winds would have piled it up until it extended above the high tide mark. Here salt tolerant pioneer plants such as sea oats would have become established, acting as sand traps and continuously increasing the elevation of the island.

However, most islands vegetated only by grasses are relatively unstable and storms readily move dunes and modify the appearance of the land over long periods of time. If, however, forests can begin to develop, they too trap wind-blown sand and may eventually form large, relatively stable dunes along their seaward edge. The outer edges of these forests may be gradually buried as the dunes slowly override the vegetation; however, this is a process of decades, or perhaps centuries, and rich, diverse forests generally develop in the lee of such dunes. Here, protected from the full force of the winds and from the action of wind-blown salt spray, many species of plants grow and provide life support for a variety of animals.⁹

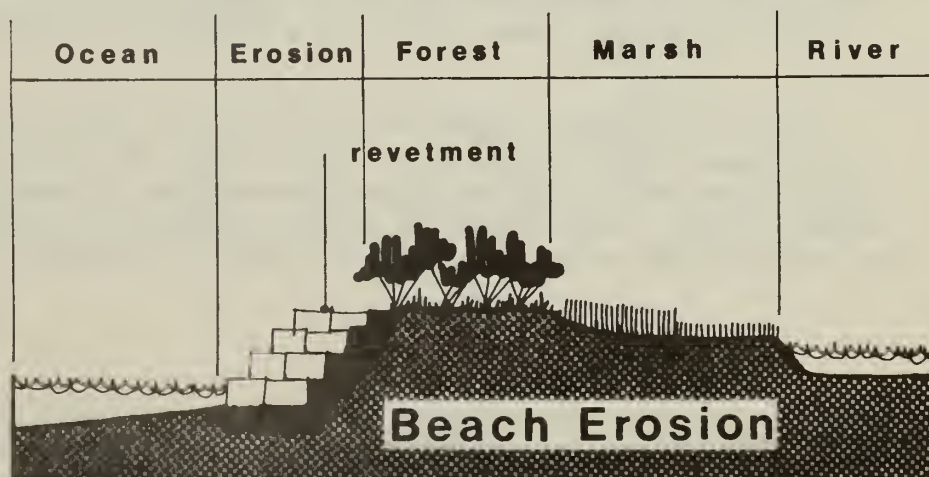


The peninsula that extends south from the Fort Fisher restoration for approximately three miles to New Inlet is a perfect example of the landshaping power of the sea. Perched precariously on the north bank of the Cape Fear River, the narrow point receives very direct pummeling from the Atlantic Ocean on the east.

Even a cursory examination of the Civil War era maps of the era reveals some astounding changes that have occurred over the last century, and, indeed, are still occurring. The area in the vicinity of the museum, now nearly three miles from the tiny inlet, was, in the 1860s a part of an extensive fort that faced, on its southeast flank, a nearby inlet of sufficient depth and width to be a major point of entry for ships going upriver from the sea via the Cape Fear River to Wilmington. A very solid causeway was later constructed from the then existing point, near the large bunker called Fort Buchanan, to Baldhead or Smith Island some four and a half miles south. This resulted in the flow of water and sand from the ocean to the river and vice versa to be virtually stopped, causing sand deposition on the tidally active south tip of the land. At the present, the sand deposition has moved the inlet approximately two miles south, producing a long continuous strip of seashore, dunes, and salt marsh where Confederate blockade-runners once eluded Union warships.

This strip of new beach, as little as 1,000 feet wide in places, appears to be grassing over and stabilizing in many sections. The beach area north of the original inlet and just east of the museum is not experiencing sand deposition, but a violent and progressive removal of the actual land mass itself. A considerable portion of the original Fort Fisher, as well as a lighthouse, have disappeared beneath the waves, and records kept since the 1930s indicate that this process is still alive. Further indications of beach encroachment include: a verticle "sand cliff" on the upper beach of twelve feet or more in height, indicating that under storm conditions the sea breakers are removing portions of the upper beach, killing vegetation on the seaward side of the adjacent forest and shrub thicket areas. The predominant vegetation here is of the most salt-spray resistant sort, yet the extreme exposure in this area is producing easily recognized salt-burned foliage.

Efforts to stop this erosion with a barrier of fairly hard limestone (gray marl) from a mainland source have met only limited success. In many places there appear to have been some negative effects on the nearby sand banks produced undoubtedly by the spray and turbulence of the sea in the vicinity of these rocks. This area is the most



heavily used part of the peninsula south of Kure Beach, and the narrowest region of high ground (only 1,000 feet from eroding beach to a narrow band of salt marsh). Perhaps the only factors that have prevented this narrow strip from becoming an inlet are the belt of natural maritime forest, primarily large live oak, and the natural outcrop of erosion-resistant Coquina limestone at several points along the beach, which forms natural jetties of considerable extent at low tide.

The surf in the vicinity of these jetties is occasionally very high, making the area one of the most popular surfing spots on the east coast. The sheltered but potentially treacherous waters between these jetties are very popular with ocean bathers. The result of this heavy use has been the loosening of the sand and grass above the beach, further compounding the problem of erosion in the vicinity of the picnic area and Battle Acre.

In conclusion, it would be wise to consult specialists on beach erosion control at every phase of planning and implementation to be certain that the wisest approach to preserving this fragile bit of land is being taken. The U. S. Army Corps of Engineers plan to build groin structures and to replace the beach in this area. These plans should be carefully scrutinized as any hasty modifications in the flow patterns of water and sand in this area could conceivably make matters worse. A violent hurricane from the southeast could, under certain circumstances, reduce the entire region under consideration to one or several small islands. It has happened many times before in similar circumstances.¹⁰

THE ISLAND'S ECOLOGICAL COMMUNITIES

Inshore Ocean Waters

The inshore ocean waters at Fort Fisher are excellent places for viewing the migration of waterbirds. Birds moving north or south appear to come inshore as they pass the cape. Here during fall or spring tremendous flocks of scooters, loons, Red-breasted Mergansers, and other seabirds may be regularly encountered.

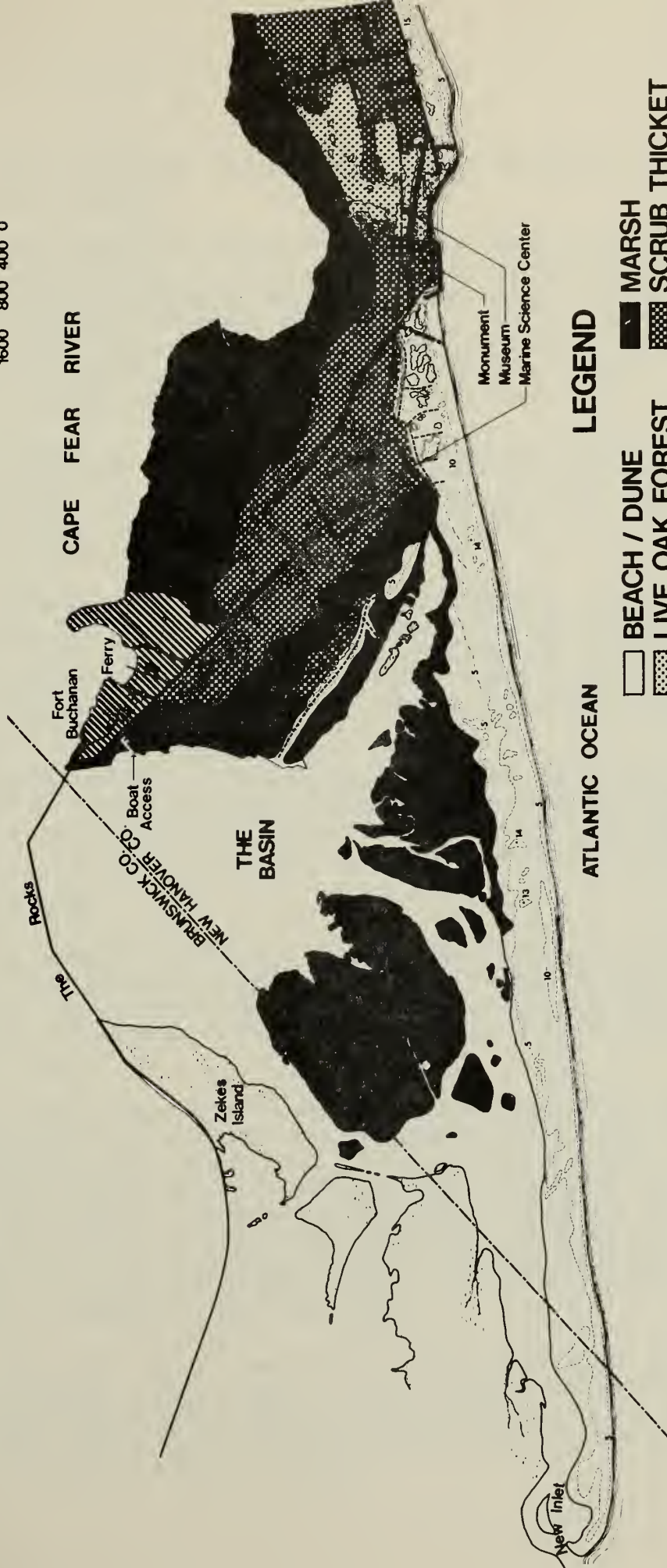
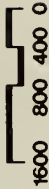
While no large whales were observed off Fort Fisher, dolphins are abundant. It was not uncommon to count fifty or more of these small mammals close in shore along the eastern beach. Specific identification was impossible, but most were probably the atlantic bottle-nosed dolphin, the most common species in North Carolina waters.

In late summer and fall the surf and offshore shoals provide excellent fishing for a number of species of sport fish. It is considered by many to be one of the best fishing areas in southeastern North Carolina. The major fish caught are bluefish, flounder, speckled trout, and channel bass. All of these species are in some way dependent on estuaries such as those at Smith Island and Fort Fisher.⁹

Sandy Beaches

Open sand and shell beaches extend from New Inlet to the mouth of the Cape Fear River. No rooted vegetation grows in this community and its form and extent are constantly changed by wind and tide. Such physical actions are strong at

FORT FISHER STATE HISTORIC SITE AND RECREATION AREA



LEGEND

- BEACH / DUNE
- LIVE OAK FOREST

- MARSH
- SCRUB THICKET
- GRASS / OLD BEACH
- PAVED ROAD
- UNPAVED ROAD
- BUILDING

ECOLOGICAL SYSTEMS

Fort Fisher and shoals and deep troughs are a constantly changing aspect of the beaches and surf.

These beaches are important nesting and feeding areas for a variety of birds. Large numbers of herring gulls, ring-billed gulls, and royal terns are regularly present along the beaches. Twenty species of shorebirds have also been recorded on the beaches and numbers of some species have been impressive. Estimates of as many as 1,500 dunlin have been made along the four to five miles of beach between New Inlet and the cape. In addition, the dowitcher, blackbellied plover, and whimbrel were often present in large numbers.

A remnant of the peregrine falcon population, which faces extinction in North America due to pesticide-induced reproductive failure, still stops at Smith Island during its fall migration. Small numbers of these rare birds were seen in October. They utilize the beaches as well as other more open communities of the island for hunting and resting.

The brown pelican, another species facing extirpation in North America regularly utilizes the beaches and inshore ocean waters at Smith Island and Fort Fisher. These birds do not breed at Fort Fisher but do winter over here in relatively large numbers. They were regularly found around New Inlet and at the cape itself throughout the fall and winter. The largest number recorded was a flock of forty-eight at New Inlet.

Several animals not usually associated with the beach community are regular visitors to the ocean's edge. The likely nest predator is the raccoon which is abundant on the island and regularly patrols the beaches after dark. Less expected is the regular occurrence of the opossum on the beaches after dark. ⁹

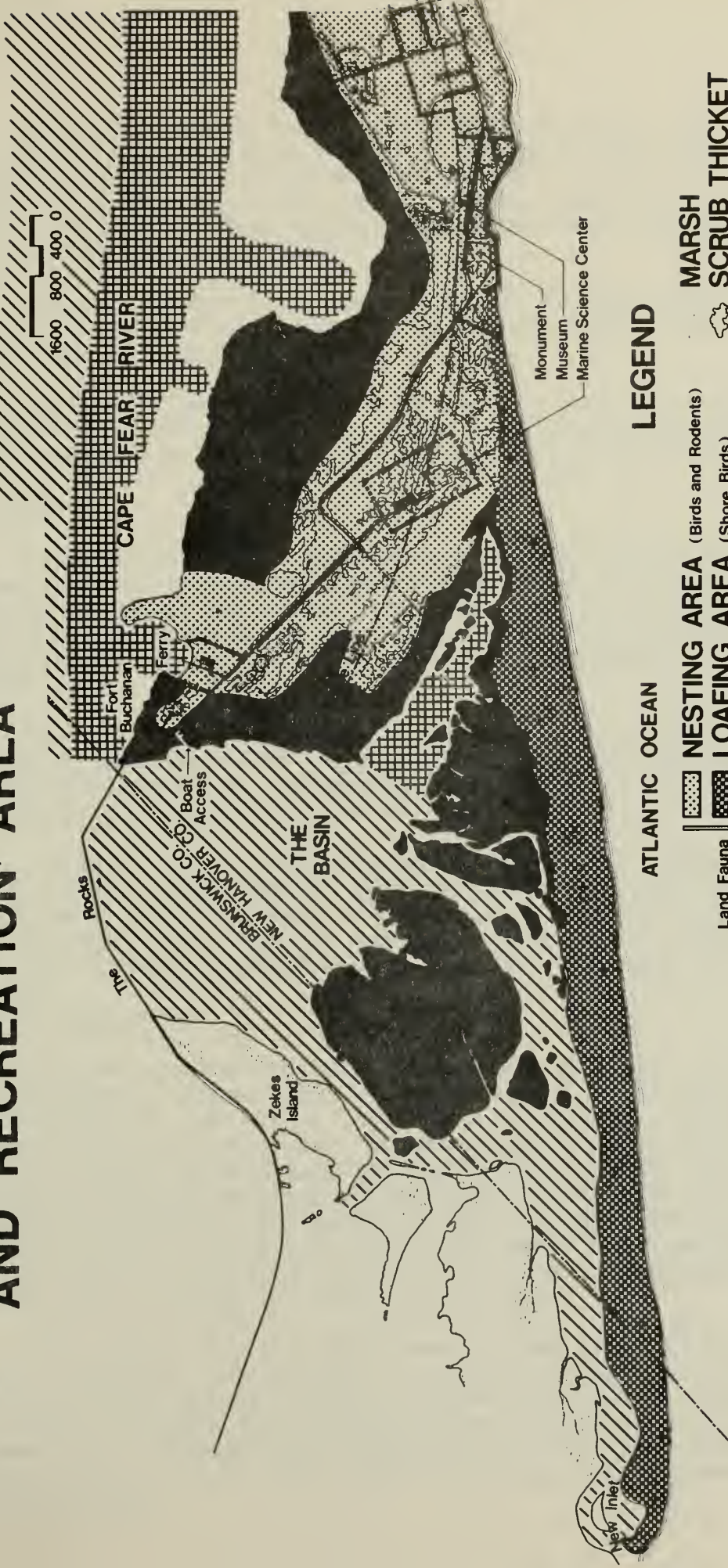
Sea Oats Dunes

This community of rolling dunes is characterized by the dominance of sea oats. Along the eastern shore, the sea oats dunes are generally low and may extend for only a few yards before grading into either shrub thickets or directly into the salt marshes. On Fort Fisher proper, dunes may approach twenty to thirty feet in height.

The importance of this community to the stability of the island cannot be overestimated. As sand is blown from beaches it is trapped by the sea oats, and a dynamic stability is achieved. The dunes gradually grow in size and move only very slowly, even with the almost constant wind action. Without the cover of these winds and salt resistant plants, which can further tolerate a slow burial by accruing sand, the dunes would rapidly move landward over the thickets. Even so, the sea oats do not completely stop the progression of the dunes. Stumps and snags of trees protruding from the dunes well to the seaward of the present forest border are evidence of this slow process.

These dunes systems have been breached by the ocean along the east beach in several places in recent years. At two locations south of New Inlet, there have been inlets since 1938. Here, the sand dunes are low and only sparsely vegetated, and autumn storms regularly wash fresh sand from the beaches over these areas into the edges of the salt marshes.

FORT FISHER STATE HISTORIC SITE AND RECREATION AREA



LEGEND

- | | |
|--|----------------------|
| NESTING AREA (Birds and Rodents) | MARSH |
| LOAFING AREA (Shore Birds) | SCRUB THICKET |
| FEEDING AREA (Birds and Water Life) | GRASS |
| PRIMARY REPRODUCTION | PAVED ROAD |
| SECONDARY REPRODUCTION | UNPAVED ROAD |
| | BUILDING |

MARINE AND LAND FAUNA

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While the sea oats dunes are very important to the stability of the site, they do not contain a large variety of vertebrate life, due probably to the generally limited and restricted food supply. The site's larger mammals move regularly through this community but only the Gray Fox seems to make its home here. Its dens have been located beneath the dunes of Baldhead and it probably feeds on the mice found there.

Reptiles are few in the sea oats dunes. The black racer is the only snake commonly found in this grassland. The burrowing eastern glass lizard and the race runner also occupy the dunes.

Relatively few birds utilize the sea oats dunes regularly. One of the most interesting is the ground dove. Flocks of boat-tailed grackles and redwings were also commonly seen feeding on the sea oats in late summer and fall.⁹

Thickets

In swales between the dunes where elevations are low and some protection from salt spray is provided, shrub thicket communities have developed. Wax Myrtle, eastern red cedar, and several sedges and rushes are usually the dominant plants. Within some thickets forest species such as live oak and loblolly pine have become established. In time these may become new elements of the maritime live oak forest.

These thickets are important resting sites for a variety of small birds during the fall migration. Between late August and early November, the thickets were often filled with warblers, sparrows, and such unusual birds as the least flycatcher and northern waterthrush.

The rufus-sided towhee is present throughout the summer and appears to nest there, but it appears further south only in the fall and winter. The cotton rat was found to be rather common along the edges of these thickets, but was not found further south. However, the towhee moves into the forest during the fall and winter, and the habitat appears suitable for nesting.¹⁰

The Maritime Forest

Only one sizeable section of the study area, in the vicinity of the museum and northwest of there, could be said to support a true forest type. Large, picturesque live oaks are by far the most significant element in this ecotype. Several live oaks just west of the maintenance area are definitely contemporaries of the Civil War. The largest specimen has an oval base with diameters of five feet and eight feet, minimum and maximum, and five major trunks from one and one-half to three feet in diameter at breast height. Such trees are a tremendous esthetic asset to any sort of park or recreation development--every effort should be made not only to protect the big trees but also to provide an adequate buffer for this most striking of eastern forest types.

Other trees and large shrubs manage to wedge themselves into the thick canopy of the live oaks. The blossoms of sweet bay and carolina laurel cherry make a spring walk through such forests a fragrant experience. Such evergreen shrubs as redbay and yaupon holly manage to form a sparse understory, although an evergreen forest is a dark place. Loblolly pine, red cedar, and diminutive palmetto may be seen in the more open forest areas along with a number of Lower Coastal Plain hardwoods.

Gray foxes, raccoons, opossums, and gray squirrels are much in evidence in the maritime forest. The eastern mole and least shrew are two extremely common but often overlooked denizens.

Many "land birds" not ordinarily associated with coastal habitats utilize the maritime forest much as they would any other. Of particular interest are the woodpeckers, from the giant pileated to the little downy and yellow-bellied sapsucker. Warblers of many types are particularly common during the migrations and in summer, while myrtle warblers utilize the treetops in winter.¹⁰

Salt Marshes

The forest gives way rather abruptly to the extensive salt marshes. Usually, a narrow band of black rush occurs adjacent to the forest. It grades rapidly into an almost pure stand of smooth cordgrass.

Along the eastern edge of the site the salt marsh usually borders the sea oats dunes or shrub thickets, with an intermediate band of salt-meadow cordgrass where only the highest tides flood the grasses.

These salt marshes, along with the creeks that drain them and the associated shallow bays, constitute the Fort Fisher estuary. While these units are discussed separately, it should be kept clearly in mind that they are in fact an inseparable functioning unit. The separation here is purely one of convenience.

These salt marshes are very important to the vertebrate fauna of Federal Point. The raccoon feeds extensively in the marsh and along the tidal creeks that drain the marsh. Nine species of herons, egrets, and ibises utilize this marsh very heavily during the summer and fall and, to a lesser degree, during the winter. During the breeding season these birds feed in the Smith Island and Federal Point marshes and return to the heronry on Battery Island to feed their young.

The white ibis, which moved into the Battery Island rookery only recently, has become one of the most abundant waders in the area and remains in large numbers throughout the winter. Scattered flocks of twenty-five to fifty may be found in the marshes even in December and January, and over 1,000 nests on Battery Island each summer.⁹

Tidal Creeks

The salt marshes are drained by a network of tidal creeks which flow into the Cape Fear River or the shallow bays between the river and the marshes. Within the creeks significant environmental changes occur over relatively short periods of time. During periods of low river, the salinity may approach that of sea water; when the river is high, the water may reach very low salinities.

Water temperature also fluctuates significantly in these creeks. In early fall, the temperatures reached 30°C, but by January the water temperature had fallen to 10°C.

While turbidity was not measured in this study, it also fluctuates greatly and may affect organisms living there.

The dominant species in the early fall are blue crab, brown shrimp, common anchovy, lookdown, northern puffer, pinfish, silver perch, spot, squid, and striped anchovy. As temperatures drop in late fall and early winter, american shad, blueback, and silversides become more common and lookdowns and northern puffers become less common.⁹

Bays and Mudflats

A series of shallow, interconnected bays extends along the northern portion of the island's estuaries. At low tide, much of this area is completely drained and consists of extensive flats and oyster bars; at high tide, the flats are flooded by as much as three feet of water.

This daily tidal rhythm and the drastic changes that it imposes result in the use of these areas by two rather different groups of animals. On the rising tide, aquatic organisms move from the deeper creeks into the shallow bays. The bays are also utilized extensively by waterfowl during the winter months.

The American widgeon is the most common species present with 500 to 1,000 ducks often present in Buzzard Bay. Black ducks and mallards are also common; and pintails, gadwalls, and green-winged teal were found in smaller numbers. Few kinds of diving ducks use these shallow bays, but small groups of bufflehead are regular visitors, and golden-eyes, canvasbacks, and scaup occasionally occur along the rock jetty at the southwest end of the island's marshes.

As the tide falls, exposing the extensive mudflats, the aquatic organisms retreat to the deeper creeks and many of the waterfowl leave the area. Many American widgeon often remain along the rock jetty, however, feeding on the exposed beds of algae. Flocks of black ducks, mallards, and pintails may also remain, loafing on the flats through the period of low tide.

These flats are also frequented by large flocks of several species of shorebirds. This is particularly true in late summer and early fall when migrants are passing through. During the fall, nineteen species were recorded with dunlin, black-bellied plovers, and short-billed dowitchers being most abundant.

White ibis, great blue herons, snowy egrets, louisiana herons, and other wading birds also frequent the mudflats, feeding on aquatic organisms left in small tidal pools.

As the tide rises, shorebirds move slowly toward higher ground and during the peak of the tide are concentrated in large numbers along the zones of over-wash where sand has washed from the beach onto the edge of the marshes. At these times several thousand birds may occur on an area of only a few acres. Some species of shorebirds move onto the beaches at this time and concentrations there on high tides are much greater than on low tides.⁹

Brackish and Fresh-Water Marshes

On the landward side, the salt marsh almost always gives way to one of two possible communities depending largely upon the elevation above sea level. If the ground rises sharply, indicating the presence of an ancient seashore line and the resulting formation of dunes, one may expect to proceed fairly rapidly

into the upland-type communities to be discussed later. Particularly on the low, sheltered west side of the Fort Fisher area, however, the salt marsh habitat very gradually gives way to areas of successively fresher water. The salt-water-soaked soil is thus supplanted by the surface-water flow from the higher parts of the land mass. It takes a fairly wide area of land to produce enough fresh surface water in such coarse sand to make this habitat possible. For this reason, this ecotype occurs only in narrow belts along the wider parts of the peninsula.

Many large grasses and sedges are characteristic of this transitional zone. Large, conspicuous genera include panicum and erianthus of the grasses and scirpius, carex, and cyperus of the sedges. Cattails form large exclusive stands. Tiny ponds, choked with peat, team with mosquitofish. This is fortunate, since such areas are prime breeding spots for their favorite food, the culex mosquitoes.

Although no alligators or insectivorous plants were located after extensive searches, such interesting denizens of coastal fresh marshes of the southeastern corner of the state cannot be ruled out entirely, as late winter is hardly a good time to be looking for either of these. Several older residents of the Kure-Carolina Beach area questioned in this regard indicated that alligators have turned up in the area occasionally over the years. Earthen slides along the banks of small ponds, were in each case most likely attributable to otters in the case of the larger slides, and mink in the case of the smaller. Tracks of both were common in the vicinity.

In slightly drier areas bordering the marsh, nearly solid stands of salt-bush were encountered at several points. Horsetweed and various savannah grasses also begin to appear at this interface. ¹⁰

Soils

The genesis of coastal soils from deposits of loose sand and shell fragments is a long and complicated process. Physical and chemical processes disintegrate and dissolve these materials, and percolating rainwater moves them downward through the developing soil. As plants take root in these young soils, their decay adds organic matter which becomes the humus so important to any soil.

With the continuation of these processes over long periods of time, soil becomes organized into definite layers or horizons. The first horizon (O) is the layer of decaying material at the surface. The second horizon (A) is the layer of humus incorporation and of maximum loss of fine materials. The third horizon (B) is the layer in which the fine materials washed down from above are redeposited. The fourth horizon (C) consists of unweathered materials similar to those from which the soils above were formed.

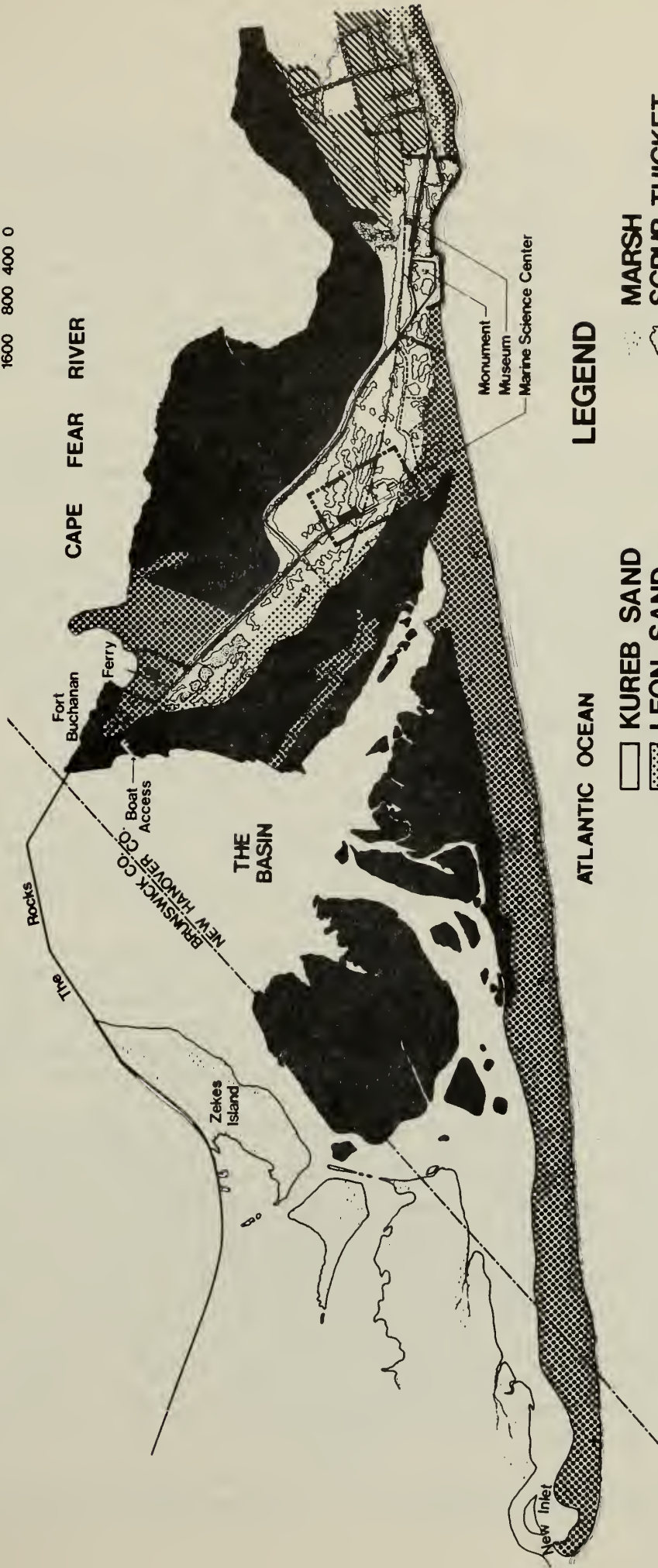
The beach sand is very fine, porous soil. It is normally associated with the newhan fine sand in the Fort Fisher area. During high tide, it is mostly under water; low tide exposes its relatively smooth, gently sloping profile.

Leon sand consists of a poorly drained nearly level soil on smooth uplands. In a representative profile, the surface layer is very dark gray sand about three inches thick over a light gray sand layer about thirteen inches thick. Under this is a dark reddish brown weakly cemented (hard-pan) sandy layer about twenty-

FORT FISHER STATE HISTORIC SITE AND RECREATION AREA



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LEGEND

ATLANTIC OCEAN

- MARSH
- SCRUB THICKET
- GRASS
- PAVED ROAD
- UNPAVED ROAD
- BUILDING

- KUREB SAND
- LEON SAND
- BEACH & NEWHAN SAND
- TIDAL MARSH
- WAKULLA SAND

SOILS

two inches thick. Underlying the weakly cemented layer or pan is light gray sand to more than sixty-four inches below the surface. Runoff is slow. Unless artificially drained the seasonal high water table is ten to forty inches for more than six months during most years. It is less than ten inches for a period of one to four months during periods of high rainfall, and recedes to more than forty inches deep during some dry seasons. Natural fertility and organic matter content is very low. Available water capacity is low. Permeability of the upper and lower loose sandy layers is rapid, while permeability in the weakly cemented layers is moderate. The problems of draining this soil is the major limiting factor for its use as sites for dwellings, campsites, picnic, playground areas and traffic ways.

Newhan fine sand consists of gently sloping excessively drained brown fine sand surface about two inches thick. The underlying soil to a depth of seventy-two inches is light gray loose fine sand.

Newhan soils are very low in natural fertility, organic matter content and available water capacity. Permeability is very rapid. Shrink-swell potential is very low. The water table is more than six feet below the surface except in the lower lying areas where it fluctuates with the daily tide. Soil reaction is neutral to mildly alkaline. They are unsuited for certain wildlife habitat elements and poorly suited for others. Newhan soils are characterized by sparse native beach vegetation. There is a probable danger of contamination of water supply source from septic tank use due to very rapid permeability of the soil.

The tidal marsh soils exist on nearly level tidal flood plains between the coastal dune sands joining the ocean and the uplands. In a representative profile, these soils have a very dark gray or black clay loam surface about eighteen inches thick. The subsurface horizons are black to very dark gray silty clay loam and silty clay. They are soft, slightly sticky, and viscous with ten to fifteen percent organic matter and a strong sulfide odor.

Soil reaction is neutral to mildly alkaline. The pH is highest where flooded daily by ocean waters. Much of the area is partially protected from undiluted ocean waters by long expanses of sand dune areas without inlets from the ocean. Much of the area is sandy due to the deep dredging operations along the Intracoastal Waterway. These soils are used mainly as a natural habitat for shore and water birds and some areas are used as shellfish gardens.

Urban land is a miscellaneous type consisting of areas where the original soil profiles have been cut, filled, graded, paved, or otherwise changed to the extent that most soil properties have been altered or destroyed. The original soils were for the most part droughty sands of the Leon series. Most of the developable land in the Fort Fisher vicinity is of this type. It was initially disturbed for defense installations and roads. Kureb urban land complex consists of areas of soils of the Kureb series and urban land that are too small (often less than one-half acre) and too intricately mixed to be mapped separately. About thirty to forty percent of the mapping units are soils of the Kureb series and about thirty to thirty-five percent is urban land. Alteration of the soils for urban land use is done primarily in site preparation for roads, buildings, and parking lots. Low areas are filled and high places leveled. Slope is generally modified to fit the site needs and may range from level to eight percent.

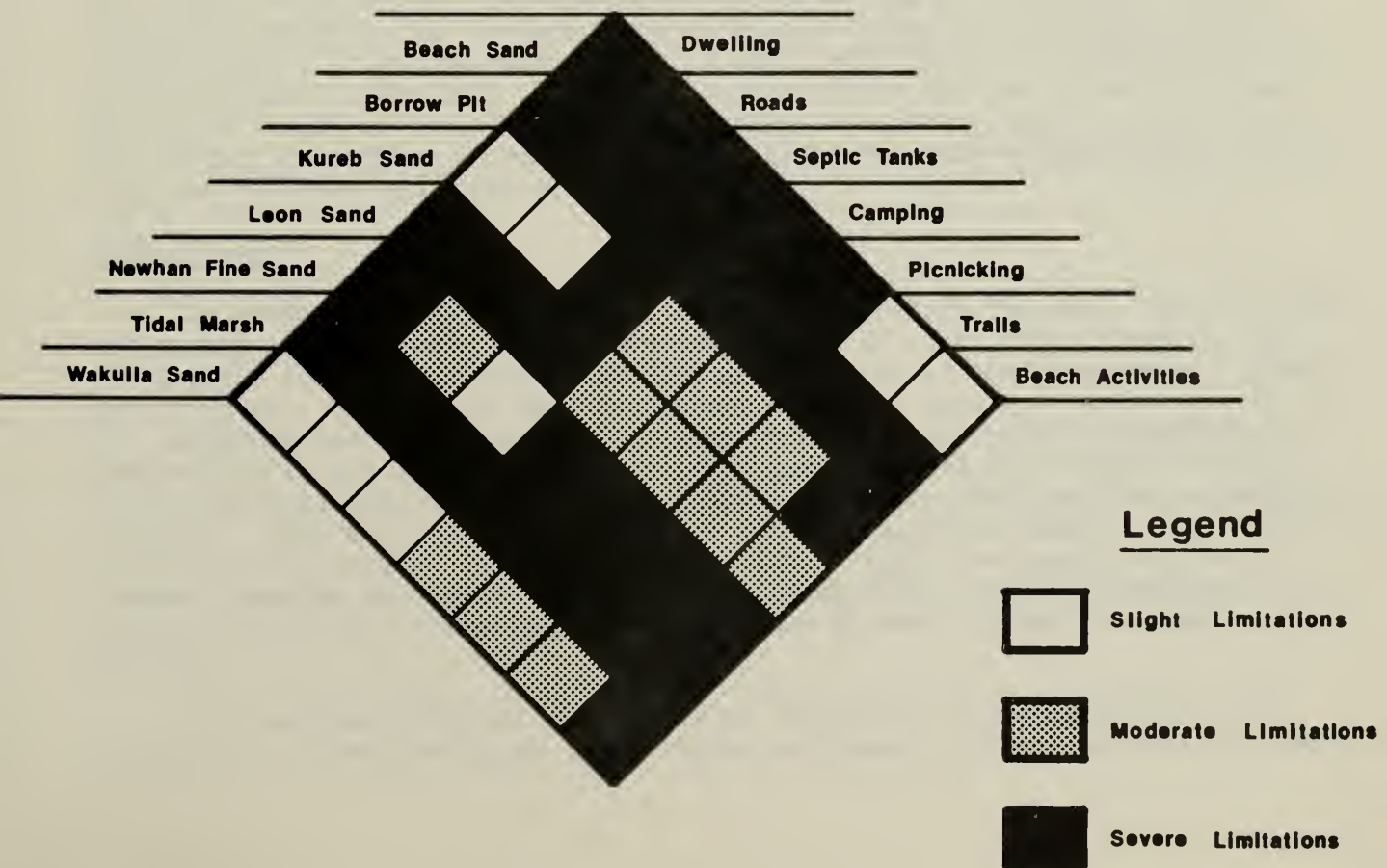
The Kureb mapping unit consists of gently sloping to sloping excessively drained sands on broad uplands. In a representative profile, these soils have

dark gray and light gray sandy surfaces about twenty-six inches thick. This is underlain with pale brown loose sand to eighty-nine inches deep.

Kureb soils are very low in natural fertility, organic content, and available water capacity. The permeability is very rapid. The water table is more than six feet deep. Kureb soils are mostly in the southern and northwestern parts of the county. They are poorly suited to most wildlife habitat elements and have low site index ratings for most trees. Soil reaction is very strongly acid to neutral. These soils are mainly used for woodland, residential and industrial sites.

Wakulla sand consists of somewhat excessively drained soil on broad nearly level to sloping landscapes. In a representative profile, the surface layer is grayish brown and light brownish yellow loose sand about thirty inches thick. The subsoil, to a depth of about forty-two inches, is strong brown very friable loamy sand. Below this is strong brown sand to eighty-four inches. The Wakulla soils are very low in natural fertility, organic matter content and available water capacity. Permeability is rapid. Shrink-swell potential is low. Except where limited, the soil reaction is strongly to medium acid. The seasonal water table stays below seventy-two inches most of the time. With a good fertilization and watering program, this soil has a high potential for most uses in its natural state. ¹¹

Soil Limitations Matrix



Geology

The geology of the Fort Fisher vicinity is characterized by deposits of the Quaternary (Pleistocene) Age, chiefly sand with subordinate amounts of clay. Shell rock and loose shells are predominant, but generally less than thirty feet thick.

The surface material consists of soils, sands, and clays that overlie either the Castle Hayne limestone formation or the Peedee formation. It generally varies in age, but represents Pleistocene marine deposits. The surface material averages more than forty feet in thickness.

The Castle Hayne limestone formation occurs near the surface, but outcrops are rare. Beds of sandy shell limestone are interspersed with loose cream colored sands and marls. The latter exists where groundwater circulation is slight. Where circulation is significant, shells have been removed by solution and cementation and recrystallization, causing the strata to become permeable limestone. Fossils compose a significant part of the formation, and phosphate nodules are also common.

The Peedee formation consists of layers of dark-gray sandy clay altering with layers of dark-green to gray glauconitic sand. The appearance is that of "salt and pepper." A few inches of impure bands or masses penetrate the formation. Shells exist throughout the formation in layers up to three feet thick. Other constituents are mica, lignitic fragments, marcasite, and sharks teeth.

The geologic structure is a gentle monoclinal dip toward the east in area as a whole. An apparent deviation from the monoclinal structure is the Cape Fear arch, known also as the Wilmington anticline and as the Carolina ridge. It appears to be a wide southeast-trending uplift, the axis of which approximately parallels the Cape Fear River. Arches around this at Wilmington and extending closer to the Fall Line on both sides of the axis are rocks of Eocene Age. The "arch" may have been formed "during late Eocene time by a buckling of the earth's crust that arched up the rocks along the axis of the ridge and bent down the rocks on each side of it." ¹²

Ground Water

The Peedee formation is a major artesian aquifer in the area. Beds of sand containing artesian water, are separated by beds of clay. Logs of wells penetrating the formation indicate that two or more beds of sand are present throughout the area. One or more hard calcareous sandstone beds are locally present. The sandstone beds are commonly less than three feet thick and are sufficiently impermeable to act as confining beds. The gravel-walled type of well drawing water from more than one sand bed is commonly used for municipal and industrial supplies. Most wells utilized for these purposes also tap sands in the underlying Black Creek formation. The specific capacity of fully developed wells in the Peedee formation is similar to that of the Black Creek, ranging from about five gallons per minute in some places to more than fifteen gallons per minute in others.

Clay beds sufficiently impermeable to separate artesian water below and unconfined, or shallow ground water above, are generally found within fifty feet

of the land surface in southeastern North Carolina. The surficial sands contain unconfined ground water that is fresh. However, in the surficial sands of the beaches and of land adjacent to the coastal waters, the water table may be no more than one foot above sea level; at such places wells may reach salty water at comparatively shallow depths.

In general, brackish water containing 250 ppm or more of chloride can be expected at a depth of 300 to 400 feet in the Fort Fisher vicinity. The chloride content will likely increase with depth. ¹²

Climate

The climate of the Federal Point vicinity is best characterized as mild temperate. The Atlantic Ocean and the Gulf Stream have a strong influence in providing both relatively mild winters and summers when compared to interior portions of North Carolina. Generally, the climate is very favorable for fishing, boating, picnicking, sightseeing and other related activities.

Wind velocity in the Wilmington area can generally be described as moderate. Average velocity is between four and ten knots per hour two-thirds of the time, with a mean year round speed of 9.2 knots. Winter speeds are generally slightly higher than in summer. Late summer hurricanes, however, are the most severe winds. Geographic location makes the area particularly vulnerable to the latter. ¹³

Wind directions are generally on a northeast-southwest axis, prevailing from the southwest. Winter winds from the north, however, frequently occur.

Temperatures in the Wilmington area have varied in the past from a minimum low of 5°F to a maximum high of 104°F. However, normal lows and highs have ranged from 37°F to 89°F in recent years. The mean temperatures are about 47.5°F in January and 79.5°F in July. ¹⁴

The area receives about fifty inches of precipitation per year. Monthly averages are usually greater in the summer with a peak precipitation average of 7.42 inches occurring during July. October is the driest month of the year with an average of 2.53 inches. The recorded maximum monthly precipitation has been 21.12 inches, with a maximum of 9.52 inches during a twenty-four hour period. The minimum monthly precipitation has been .02 inches. ¹⁵

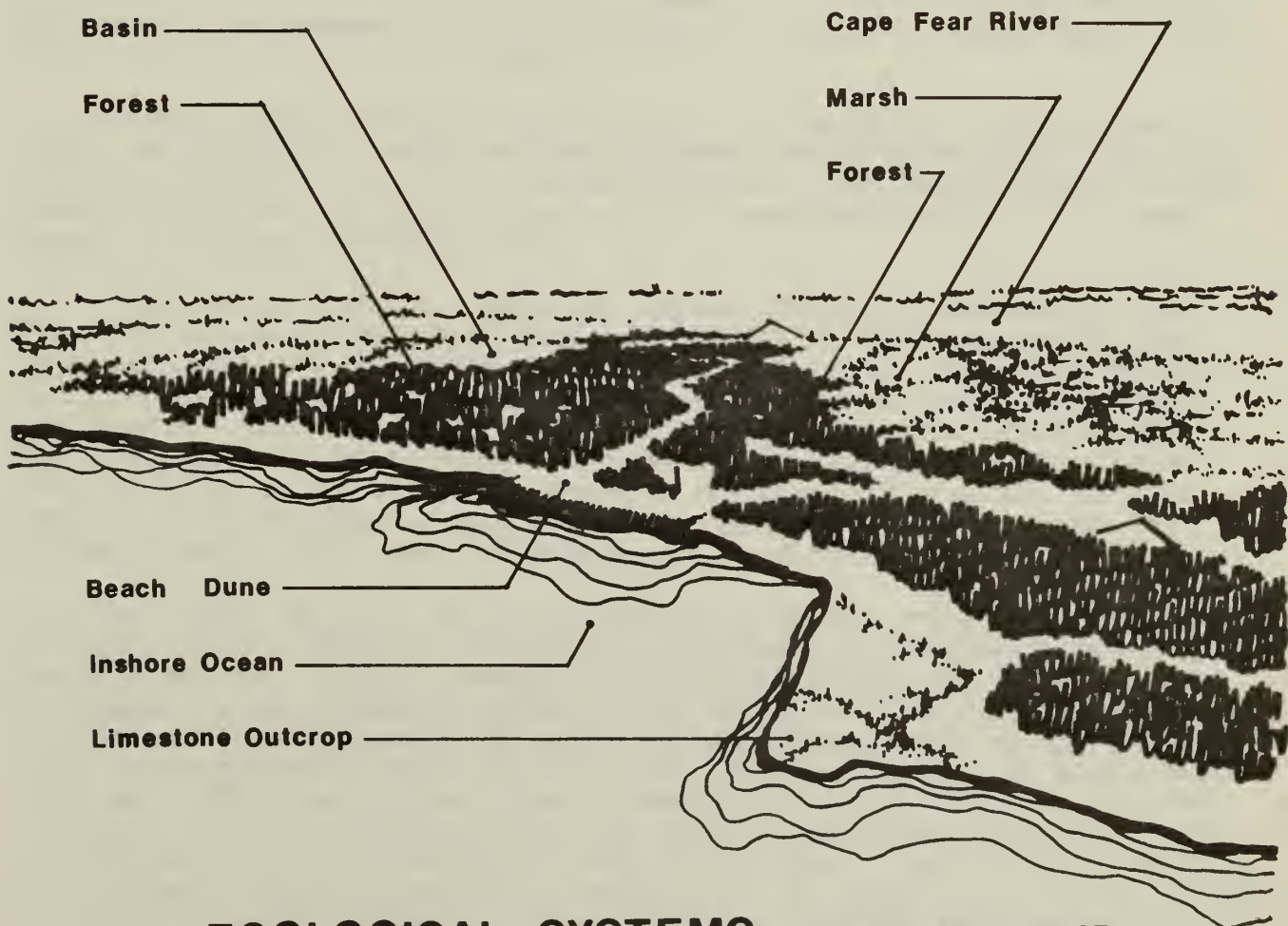
COMMUNITY GENERALIZATIONS

It is particularly obvious that the whole eastern section of the island complex from beach to salt marsh edge is very unstable. New Inlet is rapidly moving south, the beach is moving back on the edge of the salt marsh, and over-washes are common.

There is an abundance of life on the island. The tremendous flocks of shorebirds and waterfowl found along the eastern edge of the island and scattered throughout the estuary, and the abundance of land birds in the thickets during the fall migration establish the island complex as an important natural bird refuge. ⁹

Approximately 400 acres of low salt marsh occurs in the Fort Fisher complex. The productivity of these marshes is well established, and the diversity of life in the creeks that drain the Fort Fisher marshes is great. While some pollution of this estuary is evident, other effects of man appear minimal.

All of the above factors indicate that the island remains an important natural system. While current studies do not yet indicate whether or not the process of speciation has led to recognizable differences between organisms living on the island and those living on the nearby mainland, it is clear that the composite fauna and flora of the island is unique. The combination of undisturbed, naturally operating environmental processes, minimal effect by man, and the presence of large components of open beach, sea oats dunes, forest thicket, and extensive marshes and shallow bays is unique. ¹⁰



ECOLOGICAL SYSTEMS **LOOKING SOUTHWEST**

ENVIRONMENTAL EFFECTS

On Federal Point, however, the dynamic nature of this community and its associated inlets pose serious hazards to intensive development of contiguous areas, particularly when that development includes erection of fixed structures, for the beach is always in motion. At low tide beach sands are windswept onto the dunes or into the ocean; at high tide they are moved laterally and offshore by the currents. The winter beach is short and steep. The summer beach is broad and flat. The eastern beach is migrating westerly, encroaching upon the adjacent dunes and maritime forest. Along this beach, storm tides frequently overwash the beach and the low dunes, forcing sand hundreds of yards into and over the salt marsh behind.

Inlets pose particular problems for development activities. They provide routes of access between the ocean and estuaries for vessels and marine organisms. They furnish clean sea water to flush the bays and tidal streams, but they are notoriously untrustworthy. During recorded history there has always been at least one inlet along the eastern beach, and sometimes as many as three. Typically, the inlets form during storms, migrate southward, and are closed by succeeding storms. The location and time at which future inlets will appear cannot be reliably predicted, nor can their subsequent rate and distance of migration. As a result, emplacement of any fixed structures along the eastern beach of Fort Fisher would be particularly precarious.

Although limited human activity on the beach temporarily disrupts the gulls, terns, and shorebirds feeding and loafing there, the birds are able to move to nearby undisturbed areas, and are little affected. When human occupancy becomes intensive, however, alternate sites are also pre-empted, and the birds permanently leave these developed areas.

The dunes also possess a number of factors inimical to human habitation. They, too, are an unstable land form. Instability in this case results from salt-laden wind, low soil moisture, and low soil nutrient content, all of which militate against establishment of a continuous vegetative cover. As a result, the dunes are constantly in motion. In lower, protected areas where shrubby vegetation has been established, slow accretion of wind-blown sand may occur until such time as the shrubs are buried or die from lack of water. On more exposed, poorly vegetated areas, a constant stream of sand flows across the surface, causing whole dunes and dune systems to migrate downwind.

The absence of shade and the constantly moving sand are adverse to permanent occupancy of this community, whereas the expansive vista provided across the dunes and adjacent beach attracts temporary and transient human use. If such use is infrequent and not intensive, it has little effect on the dune community; where it is of sufficient intensity to remove the stabilizing effect of dune vegetation, the consequences can be severe. Dunes formerly migrating at imperceptible rates may suddenly accelerate, covering vegetation, roads, driveways, and even cottages. The fore-dune, existing as it does in a precarious position closest to the ocean, is particularly vulnerable to this abuse. Destruction of the fore-dune, either through the removal of vegetation or by engineering methods, removes the natural barrier between man and sea, opening all lands behind to the effects of storm tides. Thus the alteration of this community can produce profound results, not only upon its own biota but upon landward communities and the development thereon.

Most of the animal life associated with the high dunes and thickets will readily adjust to limited development. The song birds now utilizing these areas will continue to live in those remnants remaining after development, and even the foxes may persist for some time.

The low dunes and overwashes along the eastern beach present a different situation. These open expanses furnish protected loafing areas for thousands of shorebirds during periods when the flats are covered by water. Permanent human occupancy would eliminate this essential requirement, and may greatly reduce the shorebird population utilizing the entire complex south of Fort Fisher.

The maritime forest and shrub thicket are the most stable communities on the island, and the most conducive to human occupancy. Here, time and protection have permitted the establishment of a forest community, providing shade and protection from the effects of salt spray. Land elevations are generally above the effects of all but extreme hurricanes, and the dune community to seaward affords protection from the direct effects of storms.

Within this community, judicious development can occur within extreme adverse environmental effects, but even here the unique nature of coastal ecology must be taken into consideration. The trees provide protection from the wind, but wind discourages activities of the mosquitoes which breed in large numbers in the marshes and other low areas within the maritime forest. If the mosquito nuisance is to be controlled by mechanical means, these wet areas must be drained or converted into clean ponds and ditches. In either case, the natural ponds now existing within the forest will be destroyed.

Like the maritime forest, the salt marshes behind Fort Fisher are relatively stable communities. Except where covered by swashes across the barrier beach or cut by the slow meandering of tidal streams, they persist relatively unchanged for centuries. Unlike the forest, they are more properly a part of the marine system, producing food and haven for aquatic organisms, and the environmental factors which sustain the marsh are particularly inimical to development. The average marsh elevation approximates the elevation of mean high tide; that is, it is the height of the average tide and will be flooded by any tides exceeding the average.

Development of these marshes poses extreme engineering as well as environmental problems. Customarily, areas to be developed are diked, and fill materials of suitable consistency are piped in by hydraulic dredge. Due to the instability of the substrate, dikes frequently fail, releasing their contents into the nearby creeks; and fill requirements frequently exceed engineering estimates as a result of compaction and dehydration. If acceptable land elevations can be obtained through fill, light structures may be supported on pilings. Even here, the low load-bearing strength of the underlying sediments and the extreme depth to hard bottom necessitate excessive numbers and excessive lengths of piling.

Within the salt marsh community, development and human occupancy are completely incompatible with the nature system. Neither can exist under conditions required by the other.

The tidal creeks, bays, and mudflats, all components of the same marine ecosystem of which the salt marsh is a member, are also both catalysts and impediments to development. In their natural condition, they compose an important segment of the coastal scene--broad expanses of open waters, flats, and meandering tidal channels through the marsh. At high tide, most of these areas may be traversed by boat. At low tide, only the deeper creek channels are navigable. The emergent bars and flats become the feeding areas of shorebirds and waterfowl, while remnant pools furnish wading birds a ready source of food.

Deepening these areas to provide more ready access for navigation destroys the shallow food-producing flats, reduces the water surface area, and requires dedication of adjacent lands for initial spoil disposal and subsequent maintenance dredging. In the absence of such improvements, only a small portion of the waters between Fort Fisher and Baldhead can be used by fishermen and boaters except at high tide.⁹

The primary nursery areas are the most important areas for the growth and development of juvenile marine crustacea and fishes. The secondary nursery areas also contain developing juveniles but to a lesser extent. The primary nursery areas are usually characterized by relatively shallow, sheltered, and low saline waters. The primary and secondary nursery areas of the Cape Fear River are roughly separated by the dredge spoil piles along the eastern side of the channel.

The main development period in the nursery areas is spring through early fall. Therefore, no activities such as dredging should be conducted in the nursery areas except for the fall and winter months. Of course, the primary nursery areas should never be altered when it can be avoided.

Dredging and filling should be reviewed on a case-by-case basis. However, in this area, as in others, the general restrictions are as follows:

1. Minimal filling and/or excavation in the above mentioned marsh areas.
2. Minimal dredging in nursery areas especially in spring and summer months.
3. No excavation through existing shellfish beds.
4. No filling of any open water unless to reclaim land lost to recent erosion.

Of course, prior to any dredging and/or filling in estuaries waters or marsh, a permit must first be obtained from the State and the U. S. Corps of Engineers.

No development should be considered that would require filling of any marsh or open water. The entire section of Cape Fear River south of Snows Cut is already polluted and the taking of shellfish is prohibited.

Any further pollutants entering the water would certainly aggravate the situation. As stated previously, any permitted dredging for channels or proposed marinas should be done in non-critical areas (non-nursery or marsh areas). Also, the dredging should be done to only the minimum depth necessary for the movement of boat traffic. Channels and basins deeper than surrounding areas often receive inadequate flushing and become stagnant. ¹⁵

MASTER PLAN

The development of a master plan for the Fort Fisher area demanded that activities be planned and designed so that their construction and use would cause the least possible damage to the historic, natural, and scenic resources. However, development should be adequate to provide public use and enjoyment of the resources of the site. Since Fort Fisher is to be principally a historic site as well as a recreation area, a wide range of programs can be offered to the site visitor. Taking advantage of the Civil War history of the site and its unique physiographic features, such recreational activities as museum visitation, ocean swimming, picnicking, and fishing can be combined into a single day-long experience. With the heavy use of the history museum and the addition of an ocean center, a projected maximum day use of three thousand people was estimated for the site during the heavy use months of late spring, summer, and early fall.¹⁶

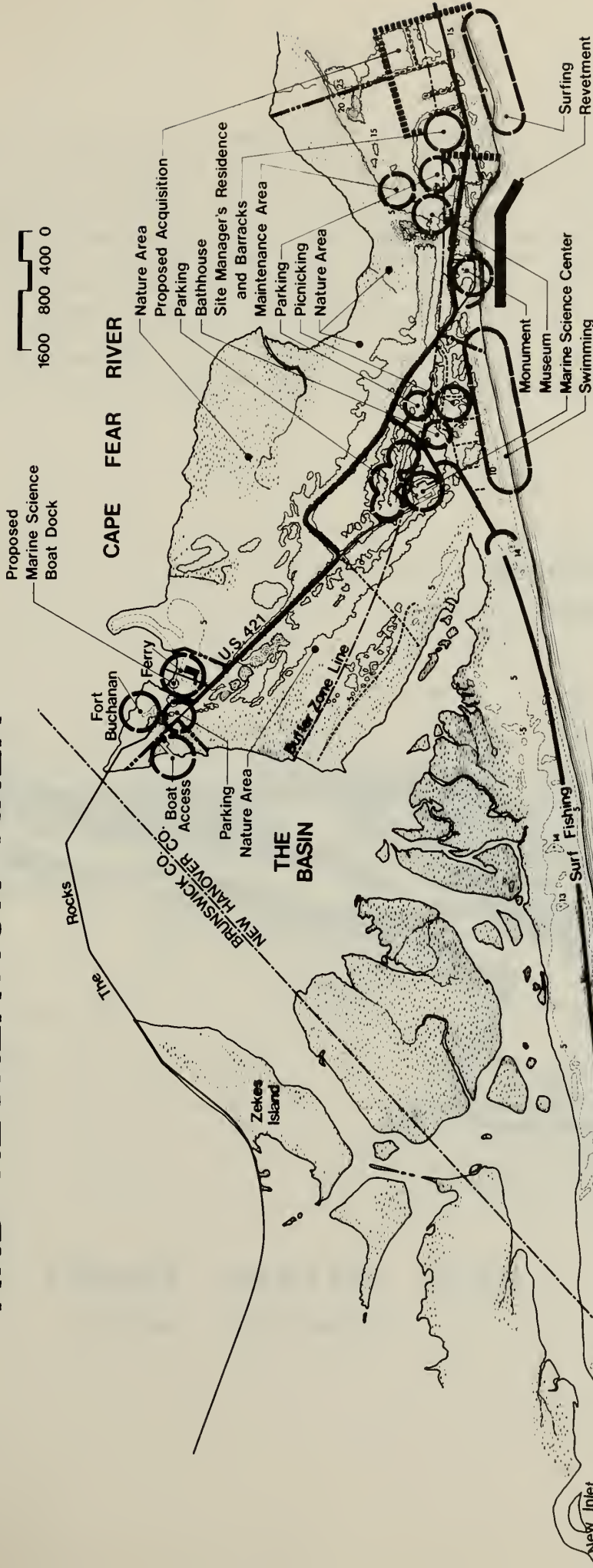
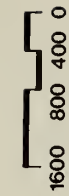
A complete display of the Civil War events is planned for the site, including not only the museum but restoration of the original palisade bunkers around the museum and a historical trail to mark other sites of historical significance in the immediate area. Also, a complete excavation is planned for other areas of the site where restoration is not practical. Such areas include the site of the palisade as it borders the ocean, and parts of the original supply stockade to the north of the museum. A complete restoration for the southernmost fortress, Fort Buchanan, is also planned.

Complementing the historical program is a series of recreation and nature oriented activities designed to complete the visitation experience. Using the natural features of the site to key the type activities provided, a program of water oriented activities is being scheduled along with such support activities as picnicking and nature trails. Ocean swimming and fishing are by far the most important recreational activities provided. Parts of the beach will be opened to swimming and the remainder to surf fishing. A boat launching area is also provided to encourage fishing in the "Basin", located in the extreme southern portion of the site.

The nature programs will be keyed to the development of the Ocean Center. The theme of the program will be to illustrate the ecological development of not only the immediate site but also of the coastal area. Nature trails will be provided and designed to illustrate the different habitats of a coastal ecological community. Emphasis should be given to the concept that illustrates the forces that created the coast and effects of each.

The extreme linear shape and the elevation of the site greatly influences the positioning and location of activities. The higher elevations were deemed to be the safest places to develop permanent structures and access roads. U.S. 421 runs the complete length of the site through the live oak and thicket forests, the highest, driest, and most stable areas of the site. Using the highway to key the location of access points, activity nodes were located on the most ecologically stable land; however, these activity nodes were also strategically placed to control access to the more fragile areas of the island, the beach and marsh areas. Three nodes were proposed for the site, the first at the present museum site, the second at the present Ocean Center site, and

FORT FISHER STATE HISTORIC SITE AND RECREATION AREA

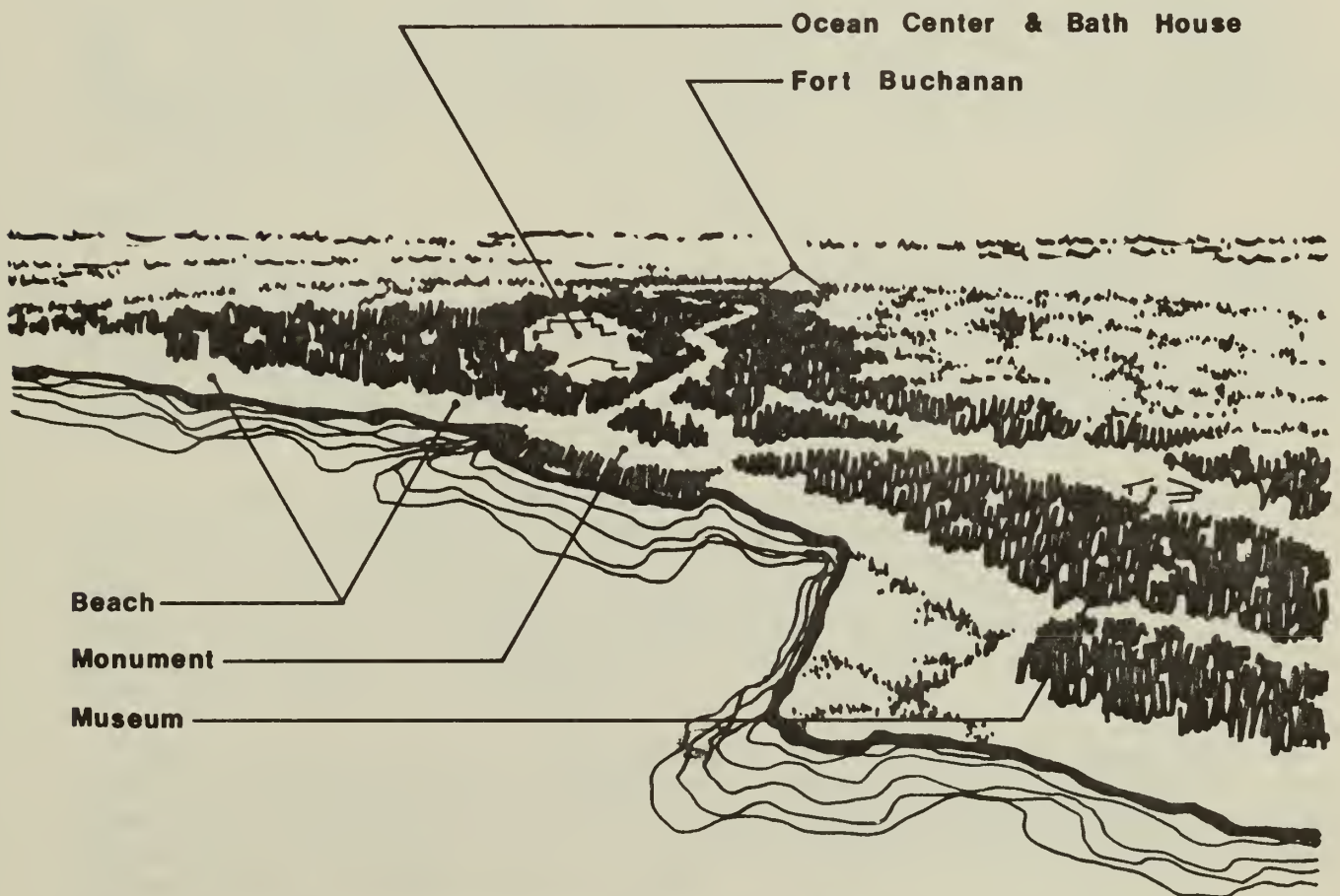


LEGEND

- MARSH
- SCRUB THICKET
- GRASS
- PAVED ROAD
- UNPAVED ROAD
- BUILDING

MASTER PLAN

the third located at Fort Buchanan. Access to the site will, of course, be from U. S. 421; however, since this is a federal highway, gates cannot be constructed to control entry into the area. For this reason, the visitor center museum will act as the official visual entry point for the recreation area, where general orientation information for users will be distributed. Information on layout, location of facilities, fees, and regulations will be provided in such a manner that the visitor can obtain it with or without an attendant present. Signs and bulletin boards shall be provided throughout the site to provide users with regulatory and directional information. In order to coordinate these facilities with those at Carolina Beach State Park, camping information about the latter park should also be provided at Fort Fisher.



FORT FISHER MASTER PLAN

LOOKING SOUTHWEST

PROVISION OF UTILITIES

Power and light to the area must be negotiated for with Carolina Power and Light. Water and sewer lines are a different story. To this date, no plans have been made by any local government, either city or county, to extend these services to the Fort Fisher area from Kure Beach. With only a minimum of facilities being specified for the recreation area, the cost to extend water and sewer to the area seems to be unwarranted. Any such extension of these services would only encourage development along land adjacent to the area, thus making control and management of the area even more difficult. Adequate land with suitable qualities for septic tanks is available; and the quality and quantity of the ground water is such that wells are a reasonable alternative as opposed to water line extension. However, if later studies determine that septic tanks could possibly pollute the ground water supply, different types of package treatment plants could be considered for the site facilities.

The provision of water for fire protection of the live oak and thicket forest also becomes an important consideration in the location of wells on the site. The summer and fall months are very dry, leaving these areas extremely susceptible to brush fire; therefore, a fire prevention program must be described and implemented for the site with the assistance of the North Carolina Office of Forest Resources.

Node #1

Program emphasis for the first activity node will be historical in theme. The Civil War history of the site shall be illustrated both inside the historical museum and outside with the restored palisade bunkers. The historic trail will be redeveloped within the area. It shall mark the layout of the original fortress according to the best historical records available. The trail will also include on its tour a visit to the Battle Acre further south.

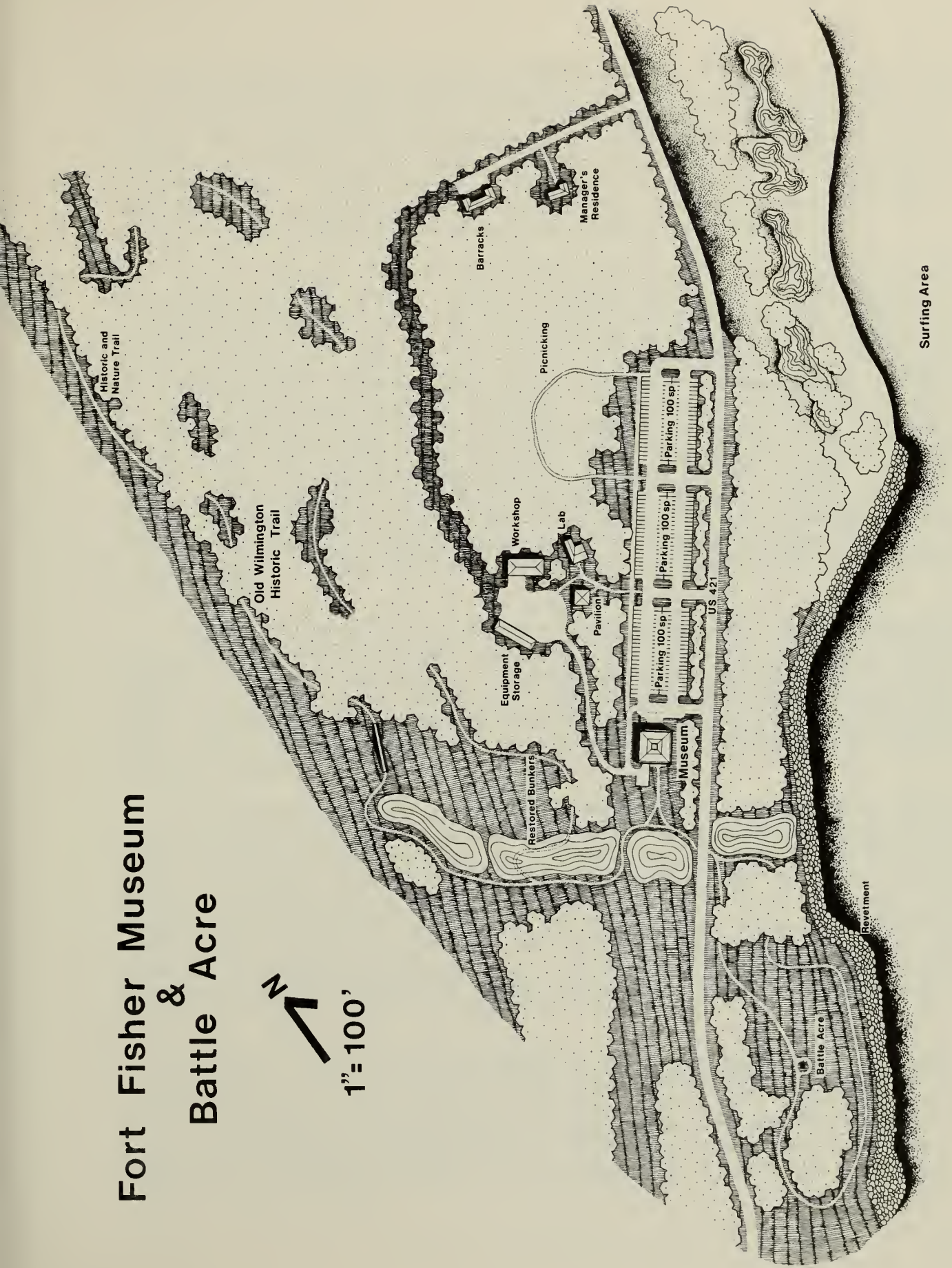
The museum is now experiencing a day use of approximately one thousand people per day during the summer months. The museum officials indicated that they hope to limit visitation to this figure. Using the 1,000 persons per day figure, approximately two hundred parking spaces are needed. This estimate assumes 3.5 persons per car and a turnover rate of four hours per visit to the museum and vicinity. A second phase parking lot of one hundred spaces could be added if the demand increases. ¹⁶

The second function of the museum area, as mentioned previously, will be to act as the official entry point for the historic and recreational area. Information concerning the site will be organized and distributed within the node. The museum building itself will be the visual entry into the area with a proper signage system to further direct traffic.

A third function of the node will be to house all maintenance and personnel facilities. Storage facilities for maintenance vehicles and other equipment will be centralized in the area immediately west of the museum. A residence for the site manager and barracks for the seasonal employees will be constructed north of the proposed parking lots. Also a temporary residence (mobile home) may be moved into the area until a permanent home can be constructed. The proposed location of the residences assumes the need to purchase all or part of

Fort Fisher Museum & Battle Acre

N
1" = 100'



the land between the existing park boundary and the Sunny Point Air Force Base to the north of the museum. The property would be an effective buffer to the site as well as providing an area for the residences and picnicking. Having already been subdivided, the property is currently under pressure to develop. The only restriction to development has been the lack of utilities, mainly water and sewer lines. Purchase of this land should be considered a top priority. If the beach were also purchased, an expanded water program becomes feasible, with the possibility of adding a surfing area north of the revetment.

However, the area has one outstanding problem, the severe beach erosion directly east of the museum. With the removal of the marl outcrop by the county for road construction in the 1920s, the beach has experienced a severe and constant erosion. This erosion is threatening the beach to the south, which is the proposed ocean swimming area. A stone revetment was constructed a year ago to slow the erosion; however, much of the revetment has been slowly destroyed by the ocean and by the compaction of sand by pedestrians and motorcycles. In order to slow the compaction problem, picnicking should be removed from the area east of the museum, the asphalt road circling Battle Acre has been recommended for removal, and buffer planting along U. S. 421 would be well advised in order to keep people out of the area. The recent Corps of Engineers study proposed several alternatives for the protection of the site. The recommended solution suggests the rebuilding and reinforcing of the existing revetment and construction of a groin system comprised of seven individual rubble-mound structures of granite stone.

Since the museum site is already being heavily used, a hard surfaced parking lot is proposed for the museum. Using the old bed of the World War II aircraft landing strip, the parking lots will extend northward from the museum along the strip. No vegetation will have to be removed and only limited grading will be done. The increased water runoff from the impervious parking lots should not pose a major erosional threat to the revetment since picnicking has been removed from this buffer.

The main environmental impact will come from the construction of the new facilities (site manager's residence, barracks, maintenance buildings, picnic area and nature trails) on the site. Construction is proposed in the live oak forest; a corridor through the forest for the access road will be cut, and sites will be cleared for the residence and barracks. These sites will require complete clearing; however, given the relatively small sizes of the sites, the clearing of the understory and part of the overstory should not create a large break in the vegetative canopy. Only minimal damage from the canopy break by salt spray should be expected. During construction, precautions should be taken to preserve as many oaks as possible.

The eight acres of picnicking adjacent to the parking lots will require clearing of only the understory. However, sand compaction by users will be the main problem in protecting the live oaks. Each picnic table area will have to be well defined and manicured; only eight tables per acre should be provided and hard-surfaced paths constructed to define the areas of use. Activity definition is necessary because it will probably be susceptible to over use during the summer months.

Of course, all of these facilities will be vulnerable to a severe storm, such as a hurricane, which has the capacity of inundating a major part of the site. For this reason, extensive development is a marginal proposition at best. Shore erosion controls are helpless in the wake of such a storm.

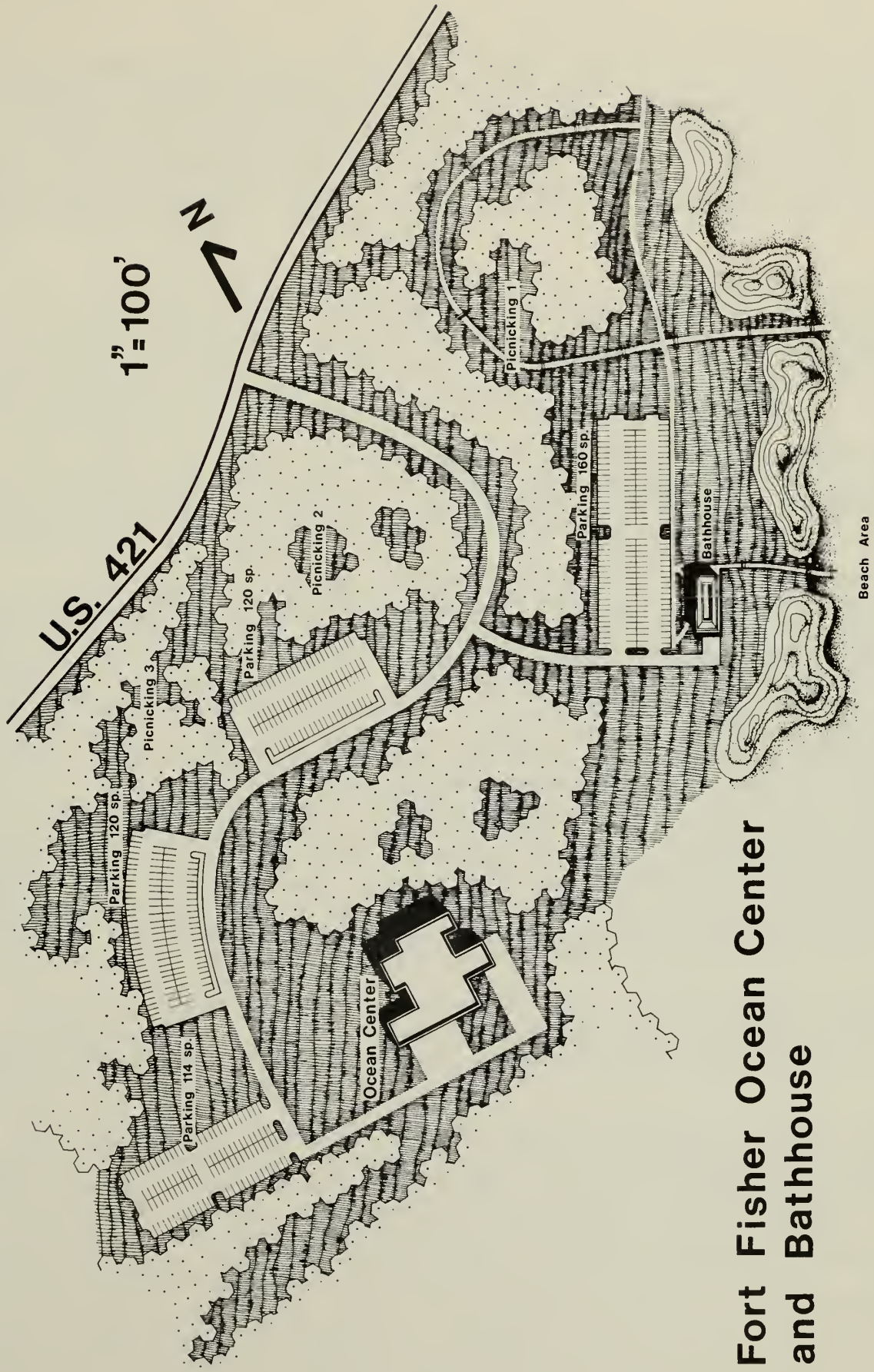
Node #2

The theme of the second node will concentrate on environmental education and outdoor recreation. With the location of the Ocean Center already in the area, its coordination with other activities becomes a reasonable idea. Beach access south of the revetment is most feasible from this area; thus allowing an opportunity to coordinate the nature exhibit activities of the beach. For this reason, a common access point was proposed for the node which would serve both the Ocean Center and the proposed bathhouse and picnicking area. Nature trails will emanate from the Ocean Center and extend into the marsh, thicket, and beach communities. The intent of such a program should be to illustrate the development of an island/peninsula community. The Ocean Center facility will have a significant effect on the human environment, both locally and regionally, by serving as a support facility for vocational training, public education, oceanographic extension, and applied research. Aquaria and other educational exhibits will be provided for the general public; these will portray the unique ecological systems typical of the nearby estuaries as well as the open ocean and continental shelf.

The facility will be available year-round for use by elementary and secondary school classes. The North Carolina Department of Public Instruction has recognized the need for an accelerated program of general environmental education in North Carolina and has cited the need for more on-site facilities and programs. The proposed Ocean Center is compatible with the state's overall plan with regard to environmental education. The facility will present educational programs and provide a base for field trips which will be available to all the school children of North Carolina. Activities planned for the Center include:

1. Extension activities and technical training to enable the marine-related industries to utilize more fully the resources of the region;
2. Public education facilities using displays, exhibits and a variety of visual aids;
3. Applied research for assessment of stocks of coastal fisheries and the technology to harvest and process unexploited or under-utilized fisheries;
4. Assessment of mineral resources and their utilization; and
5. Public information to aid the public in use of the area for recreational purpose. ⁴

The design concept assumes that those visitors who come to the Ocean Center will also swim and picnic as well as investigate the nature trail. Along with the museum programs, a complete recreational experience is possible with the programs proposed for the Ocean Center and water-oriented facilities. Preliminary



estimates, using recreation standards, revealed a maximum of 2,000 people per day could use the node. However, with the dispersion of people over the total site, no more than a thousand people are anticipated in any one area. For this reason, the first increment of parking has been estimated to be about 245 spaces, 85 for the Ocean Center and 160 for the bathhouse and picnic area. Two parking lots of 120 spaces each and support picnic areas are proposed as the demand pattern indicates. Another parking addition to the Ocean Center of 40 spaces is also possible in the future. 16

The location of the bathhouse and Ocean Center is on the higher elevations of the site in the forest thicket community. The picnic area is also located in the thicket adjacent to the bathhouse. Elevated paths from the bathhouse and picnic area should be constructed to carry pedestrian traffic through the primary dune area to the beach to prevent dune destruction. Like paths should be constructed for the nature trails as they advance into the marsh.

Even though the Ocean Center and bathhouse are located at the higher elevations, they will still be subject to periodic flooding once every ten years. Therefore, an elevated foundation and finished floor elevation is recommended for the bathhouse as has been done for the Ocean Center.

A second problem facing any permanent structures in this area is the increased beach erosion taking place along the revetment. If nothing is done to hasten or stop this erosion, the beach/dune system now protecting the proposed bathhouse site will be threatened in the near future. Preliminary precautions can be taken to protect the dunes by closing off uncontrolled beach access routes along U.S. 421. A controlled access to the beach for fishermen with vehicles can be developed in the bathhouse area. Vehicles pose no particular threat to the beach itself; however, many people have abused the dune system with their vehicles. If a vehicular beach access program were approved, it would have to be strictly managed and enforced. Such a program already exists at the Cape Hatteras National Seashore which is administered by the National Park Service. Vehicular beach access is limited to designated routes or ramps outside the swimming areas during the summer months, May 25 to September 10. Driving is restricted to that portion of beach which lies between the foot of the dune and the ocean. Dune driving is prohibited. All vehicles must have a current state road registration and the operator must have a valid driver's license.

An access control point and a designated route could be provided off the access road which leads to the bathhouse. A designated route would lead southward from the proposed maintenance road, and access could be controlled by personnel at the bathhouse.

Water runoff from impervious surfaces such as parking lots, roads, and building roofs should not be a severe problem since only four percent of the ninety acres would have an impervious surface. If the drainage plan spreads the runoff over a series of points along the periphery of the surface, it should dissipate without accumulating in any one area, posing no threat to flooding and only a limited erosion problem. The real environmental impact will come from the increased use of the area by recreational visitors. The increased pedestrian traffic will cause compaction problems if hard surfaced trails are not built and maintained. Asphaltic trails should be constructed in the forest thicket and elevated trails should be built in the dune and marsh communities. Access to these trails should be well marked and reflect the circulation pattern of the users.

However, the construction of these facilities (bathhouse, parking lots, and trails), will cause a serious disruption of the site. Vegetation will be removed and minor earthwork will be done to prepare the site. This disruption has been kept to a minimum with the location of the permanent structures in the forest thicket and by the limited number of facilities proposed. Hopefully this managed use of the area will prevent the unstructured and destructive activities which now occur on the site.

Node #3

The third node, Fort Buchanan, will require the coordination of several different uses. Coordination of the historic site, ferry service, boat launch, and "Basin" fishing area is necessary in order to make the area work functionally. With such a mixed use, the primary objective is to reduce conflict among the uses and create a smooth flow of traffic. For this reason, a common parking area is proposed for the historic site and "Basin" fishing area located on the "Rocks" at the extreme southwestern portion of the site. Phase one calls for construction of a hard surfaced lot of at least thirty spaces, twenty for the fishermen and ten for the historic site. Visitation to the Fort Buchanan Bunker is expected to be approximately one-third of museum visitation, with a turnover rate of one hour. The "Rocks" has been a favorite fishing area for years; therefore, we suggest an initial parking increment of twenty spaces, which can be adjusted later as the demand pattern indicates.¹⁷ Access to the boat launching area will be provided adjacent to U.S. 421. Small fishing boats can be launched from the facility for fishing in the "Basin." Parking for trailers is also provided on the four-acre launching site.

The ferry service will remain intact with only one exception. Located on the ten-acre site in the extreme southern portion, the Ocean Center is proposing a small boat dock to be used in conjunction with the center's research programs. Negotiations between the Departments of Administration and Transportation have been completed for the final coordination and location of the dock; approval of the Sunny Point Terminal remains to be obtained. Thus, no disruption of the Fort Buchanan Bunker will be required by the location of the dock.

The greatest environmental impact will again come from the increased use of the area. However, instead of the site being used in an unstructured, uncontrolled fashion, specific use areas will be defined and managed. Presently, the historic site, Fort Buchanan Bunker, is being destroyed by motorcycles and dune buggies; picnicking has also occurred indiscriminately on the bunker, with litter being a major visual eyesore. Hopefully the design will eliminate these site problems. The Division of Archives and History is planning to excavate and restore the bunker and place exhibits on the site. The parking lot is currently planned for a relatively level portion of land southeast of the bunker. Minimal grading will be required and no significant vegetation will be removed since this area was originally the old beach head when "New Inlet" was open during the Civil War era. The construction of the boat launch will require the loss of about three acres of marsh. Dredging will be required in this area which has been designated a secondary reproductive area.

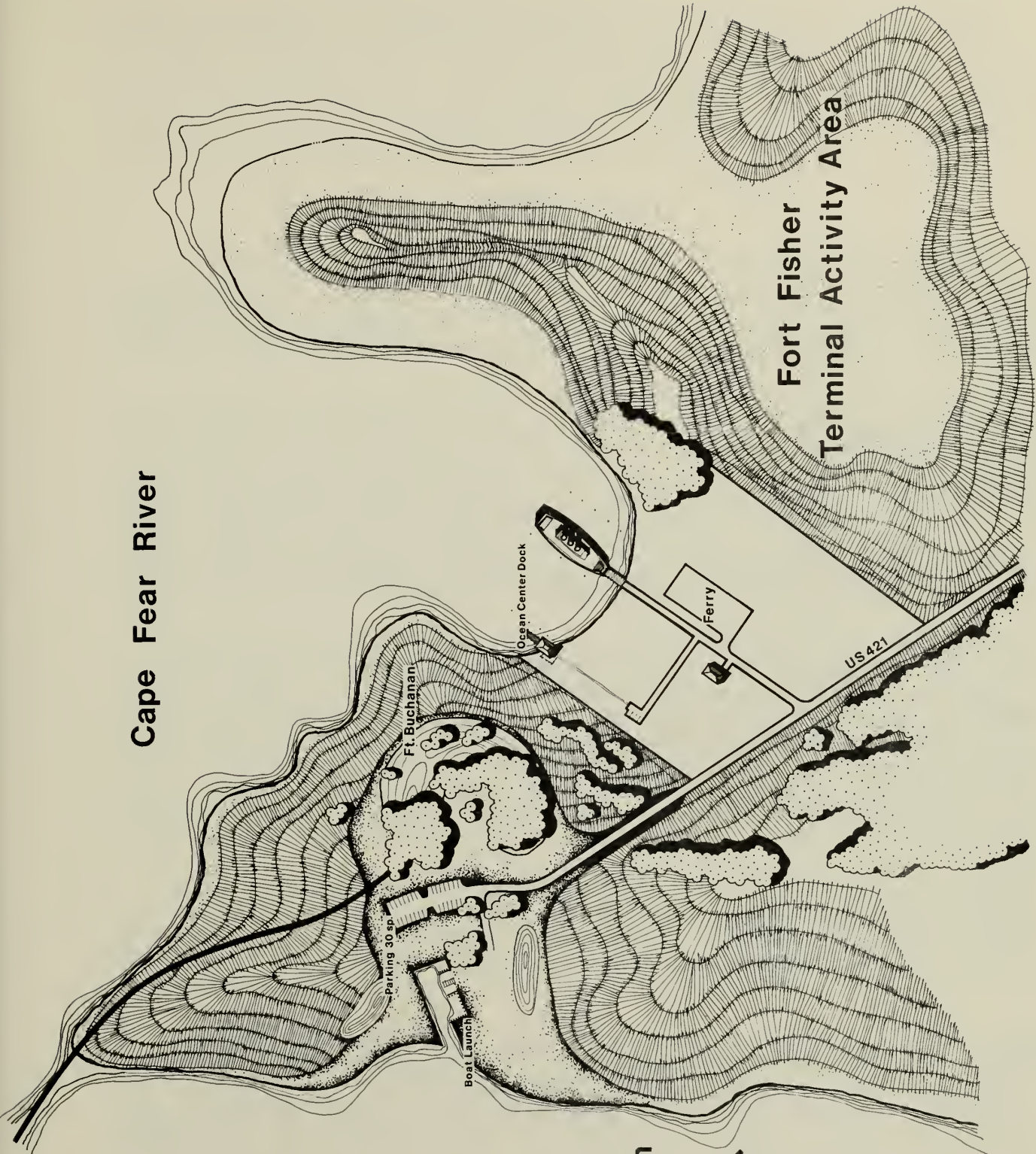
The other construction project involves the building of the Ocean Center boat dock. The site including the ferry dock was originally classified as a primary marine reproductive area. However, when the ferry was built several

Cape Fear River

The Basin

Fort Fisher
Terminal Activity Area

1" = 100'



years ago, extensive dredging was necessary to clear a channel; thus the reproductive area was completely destroyed. The new docking facility will not require dredging since it will use the ferry channel. The ferry site already has access from U.S. 421 and a parking lot; so the addition of parking for the boat dock will cause no further environmental changes on the site. The capacity of the dock is designed to handle from two to three small water craft not exceeding fourteen feet in length.

MANAGEMENT PLAN

The master plan itself will not solve all the site problems; in order to protect the historic areas and natural features of the site, a comprehensive management plan is needed. A clear, concise management plan should be considered as part and parcel to the completion of the total plan. Responsibilities must be clearly defined, and efficiently executed for the master plan to succeed.

Since the primary theme of the site is historical, with recreation and nature study of secondary importance, the Department of Cultural Resources should have control of the site in order to protect and manage the historical sites. Using its Division of Archives and History as the direct site agent, control and decision making power over the site should be vested with their representatives. Control over future development as well as day-to-day supervisory responsibilities should be within the hands of their representatives. Supervision over site management duties such as law enforcement, site maintenance, and program administration should be the responsibility of the division.

However, it should also be recognized that Archives and History does not have the expertise to establish or manage natural and recreational programs. For this reason the Departments of Administration and Natural and Economic Resources have been asked to assist Cultural Resources with the establishment and management of these programs. The Division of State Parks is willing to assist with the management of the recreational programs specified in the master plan. The Ocean Center representatives are also willing to provide space within their building for exhibits. Office space for personnel participating in the nature trail program has been requested from the Department of Administration.

Since the Department of Transportation's ferry service does not interfere with any recreation area functions, we recommend letting them run its program as it has previously. Operating times offer no conflict with those proposed for the site. This service should be viewed as a compatible and valuable use of the recreation area.

Personnel requirements for Archives and History include: one site manager, one assistant site manager, one full-time receptionist, one part-time receptionist (weekends), one grounds maintenance foreman, two full-time grounds maintenance men, and two part-time grounds maintenance men (summer). The site manager will be responsible for all continuing programs on the site sponsored by Archives and History. He will administer historical research and protection programs, law enforcement policy, and maintenance programs. He will coordinate overlapping programs involving Archives and History, the Ocean Center, and State Parks to ensure that these programs do not compromise the main objectives of the area. His office shall also be responsible for distributing information and controlling site uses from the hours from 8:30 AM to 5:30 PM seven days a week.

After closing hours from 5:30 PM to 8:30 AM, a patrol staffed with two Pinkerton men will enforce the rules and regulations of the recreation area. The assistant site manager will assist the site manager with all duties required by him. The remainder of the site manager's office staff will consist of a full-time receptionist and one part-time receptionist for the weekends.

The maintenance staff will consist of one foreman, two full-time and two seasonal (summer) employees; they will be directly responsible to the site manager's office. The maintenance staff will be responsible for landscape maintenance, garbage collection on the site, and minor equipment repairs. A dumpster system is recommended for garbage collection at the activity areas and Archives and History can then contract with a local company to transport the garbage off the site. The staff should also be trained in fire fighting techniques and be properly equipped to handle minor fires on the site. Further precautions should be taken to protect against more extensive fires in the thicket and oak forests by preparing a fire protection plan through the site manager's office with the assistance of the North Carolina Office of Forest Resources.

Programs administered through the Ocean Center shall be the responsibility of the Department of Administration's Marine Science Council. It will process applications and allocate space for agencies requesting participation in the programs of the Center. A permanent full-time staff of six administrators will be required to adequately run the Center. Budgeting responsibility for the Center's programs will remain with the Marine Science Council. Maintenance within the building will be handled by a small custodial crew sponsored by the Center; however, grounds maintenance will be the responsibility of the maintenance crew requested by Archives and History.

The Division of State Parks will assist Archives and History with programming, staffing, operating, and maintaining the proposed water recreation facilities. Specific responsibility of the operation of the bathhouse and related activities will be assumed by State Parks on a three-month per year basis, June 1 until September 4. Archives and History will provide the bathhouse facility and year-round maintenance to the building. During the three months of operation, the bathhouse and beach swimming area will require the following personnel: 1 full-time Ranger II, 1 bathhouse manager, 1 refreshment stand manager, 1 chief lifeguard, 4 lifeguards, 1 bathhouse operator, 1 refreshment stand clerk, and 1 park attendant. The Ranger II will be responsible for supervising all activities connected with the bathhouse during the three-month period, and he will work directly out of Carolina Beach State Park. All other employees will be full-time seasonal.

Seasonal activities responsible to State Parks, other than the bathhouse operation, include supervision of the swimming and picnicking areas (associated with the swimming area only), and maintenance over each of these activities. Maintenance responsibilities shall consist of garbage collection, and simple equipment repairs.

Upon agreement of the Department of Cultural Resources, the Department of Administration, and the Department of Natural and Economic Resources, a naturalist may later be assigned to coordinate plans for both research and layout of nature trails on the site and to supervise the design of a state park's exhibit at the Ocean Center.

DEVELOPMENT PRIORITIES

Priority #1

Stabilization Program

1. Apply for funds to repair the revetment.
2. Close the road around the Battle Acre monument to vehicular traffic.
3. Begin a restudy of the erosion problem along the eastern shore of the site.

Maintenance Program

1. Apply for funds for additional maintenance personnel.
2. Develop an interim operational summer program with Carolina Beach State Park.
3. Develop a uniform signing system for the recreation area.

Recreation and Nature Study Program

1. Request space for State Park's Naturalist and his programs in the Ocean Center. (State Parks)
2. Request funds for bathhouse personnel. (State Parks)
3. Begin research for Nature Study Program. (State Parks)
4. Apply for funds and construct bathhouse, parking (Phase I), and picnic area by Archives.

Historic Sites

1. Excavate the Palisade Bunkers along the beach.
2. Excavate Fort Buchanan.
3. Request additional space for historic displays in the Ocean Center by Archives.

Priority #2

Maintenance Program

1. Request money for purchase of the Orrell property north of the museum.
2. Hire additional maintenance personnel.
3. Develop Dune, Fire, and Beach Access Ordinances, and a Fire Protection Plan.

4. Designate final sites for maintenance facilities.

Recreation and Nature Study

1. Begin leasing buffer area property from the Air Force. (State Parks)
2. Hire the park naturalist for summer programs at Fort Fisher. (State Parks)
3. Designate preliminary sites for bathhouse, picnic area, and nature trails. (State Parks)

Historic Sites

1. Excavate the area of the proposed maintenance facilities and residence.
2. Excavate the site of the proposed bathhouse picnic area, and nature trails.

Priority #3

Stabilization Program

1. Close all uncontrolled access roads to the beach and marsh areas.
2. Beach erosion study completed and action program developed.

Maintenance Programs

1. Construct storage garage for maintenance machinery.
2. Construct temporary site manager's residence.
3. Dismantle World War II signal tower.

Recreation and Nature Study

1. Develop access to the bathhouse and Ocean Center.
2. Delineate nature trails and temporary parking at Fort Buchanan.
3. Hire permanent Naturalist and Ranger II. (State Parks)
4. Begin beach access program for fishermen.

Historic Sites

1. Close picnic area across from the museum, and begin screen planting.
2. Develop new picnic area for museum.
3. Restore Palisade Berm across from the museum.

4. Pave Phase I parking at the museum.
5. Layout "Wilmington Historic Trail."

Priority #4

Stabilization Program

1. Begin a Dune Planting program.
2. Begin action program based on Beach Erosion Study.

Maintenance Program

1. Construct barracks.
2. Evaluate the feasibility of building a permanent site manager's residence.

Recreation and Nature Programs

1. Develop elevated nature trails to beach and marsh areas.
2. Develop permanent parking at Fort Buchanan for the fishermen.

Historic Sites

1. Develop Phase II parking lot if demand indicates at museum.
2. Restore Fort Buchanan and develop exhibits for site visitors.

APPENDIX A

BIRDS OBSERVED DURING THE STUDY OF THE FORT FISHER AREA
FEBRUARY 23-27, 1974

COMMON NAME	LOCATION
Common Loon	Common on ocean and river.
Red-Throated Loon	Present on ocean and river.
Horned Grebe	Common on ocean and river.
Brown Pelican	20-30 on beach near New Inlet.
Double-Crested Cormorant	Abundant on ocean and river.
Great Blue Heron	Present on tidal creeks.
American Egret	Common on tidal creeks.
Snowy Egret	Common on tidal creeks.
Louisiana Heron	Common on tidal creeks.
Little Blue Heron	Common on tidal creeks.
White Ibis	7 observed over salt marsh, 4 immature.
Baldpate	Large flock near rocks.
Greater Scaup	Common on ocean and river.
Buffle-Head	Common on river and tidal creeks.
Surf Scoter	Occasional on ocean.
Ruddy Duck	Common on river and tidal creeks.
Red-Breasted Merganser	Present on ocean, river, and tidal creeks.
Turkey Vulture	Occasional.
Red-Shouldered Hawk	Common in forest and shrub thickets.
Turkey Vulture	Occasional.
Red-Shouldered Hawk	Common in forest and shrub thickets.
Marsh Hawk	Occasional over marshes.
Osprey	1 in vicinity of Federal Point.
Peregrine Falcon	1 in vicinity of Ferry Dock, February 25, 26, 27.
Sparrow Hawk	Common over shrub thickets.
King Rail	Common but seldom seen; brackish marshes.
Clapper Rail	Common but seldom seen; salt marshes.
Oyster-Catcher	A few present in vicinity of rocks.
Semipalmated Plover	Common on mudflats.
Black-bellied Plover	Common on mudflats and beach.
Ruddy Turnstone	Present in vicinity of rocks.
Willet	Common on beach and mudflats.
Yellow-Legs	One observed on mudflats; prefer fresh-water marshes.
Red-Backed Sandpiper	Occasional on mudflats and beach.
Dowitcher	Common on mudflats.
Semipalmated Sandpiper	Common on mudflats and beach.
Western Sandpiper	Common on mudflats.
Sanderling	Abundant on beach.
Great Black-Backed Gull	Several present; feed on ocean and river; roost near New Inlet.
Herring Gull	Common.
Ring-Billed Gull	Common.
Laughing Gull	Common.
Forster's Tern	Scarce over ocean and river.

APPENDIX A CONTINUED

BIRDS OBSERVED DURING THE STUDY OF THE FORT FISHER AREA
FEBRUARY 23-27, 1974

COMMON NAME	LOCATION
Royal Tern	1 observed near Federal Point.
Mourning Dove	Occasional in forest.
Belted Kingfisher	Occasional over ponds and tidal creeks.
Flicker	Common in forest; also utilize shrub thickets.
Pileated Woodpecker	A few in forest.
Red-Bellied Woodpecker	Common in forest.
Red-Headed Woodpecker	A few in forest.
Yellow-Bellied Sapsucker	Common in forest.
Downy Woodpecker	Common in forest.
Phoebe	A few in vicinity of buildings.
Blue Jay	Common in shrub thickets and forest.
Fish Crow	Common.
Common Crow	Occasional in forest.
Tufted Titmouse	Common in shrub thickets and forest.
Carolina Chickadee	Present in forest.
Carolina Wren	Common in shrub thickets and forest.
Long-Billed Marsh Wren	Occasional in cattails and salt marsh.
Mockingbird	Common in shrub thickets.
Catbird	Common in shrub thickets.
Brown Thrasher	Common in forest.
Robin	Occasional on lawns.
Eastern Bluebird	Scarce in forest.
Ruby-Crowned Kinglet	Common in forest.
Cedar Waxwig	Flocks utilize Wax Myrtle and Yaupon berries
Loggerhead Shrike	Present in shrub thickets.
Starling	A few near buildings.
Myrtle Warbler	Abundant in shrub thickets and forest.
Pine Warbler	A few in forest.
Palm Warbler	Fairly common in shrub thicket.
House Sparrow	Common in vicinity of buildings.
Meadowlark	Common in open areas.
Red-Winged Blackbird	Common in marshes.
Boat-Tailed Grackle	Common.
Common Grackle	A few observed with Red-Wings.
Cardinal	Common in shrub thickets.
Goldfinch	Common in open areas.
Towhee	Abundant in shrub thickets.
Savannah Sparrow	Open areas.
Sharp-Tailed Sparrow	Salt marsh.
Seaside Sparrow	Salt marsh.
Slate-Colored Junco	Occasional in forest.
Field Sparrow	Old dunes.
White-Throated Sparrow	Forest and shrub thickets.
Swamp Sparrow	Marshes and old dunes.
Song Sparrow	Old dunes and shrub thickets.

APPENDIX B

MAMMALS OBSERVED OR DETECTED DURING THE STUDY OF THE FORT FISHER
AREA, FEBRUARY 23-27, 1974

COMMON NAME	LOCATION
Opposum	Common in forests and shrub thickets.
Least Shrew	Dry areas.
Eastern Mole	Abundant in dry areas.
Eastern Cottontail	Old dunes, shrub thickets.
Gray Squirrel	Forest.
Marsh Rice Rat	Salt marshes.
Atlantic Bottle-Nosed Dolphin	Ocean.
Gray Fox	Common in many habitats.
Raccoon	Common in many habitats.
Mink	Marshes.
River Otter	Fairly common in marshes.

APPENDIX C
PRELIMINARY VEGETATION LIST

COMMON NAME	SCIENTIFIC NAME
Yaupon	<i>Ilex vomitoria</i>
Cabbage Palmetto	<i>Sabal palmetto</i>
Sea Elder	<i>Iva imbricata</i>
Red Cedar	<i>Juniperus virginiana</i>
Sedge	<i>Carex stipata</i>
Sedge	<i>Cyperus strigosus</i>
Gray Shrubby Croton	<i>Croton punctatus</i>
Dune Spurge	<i>Euphorbia polygonifolia</i>
Live Oak	<i>Quercus virginiana</i>
Black Rush	<i>Juncus roemerianus</i>
Red Bay	<i>Persea borbonia</i>
Bamboo-brier	<i>Smilax laurifolia</i>
Wax Myrtle	<i>Myrica cerifera</i>
Loblolly Pine	<i>Pinus taeda</i>
Broom Sedge	<i>Andropogon virginicus</i>
Panic Grass	<i>Panicum amarum</i>
Saltmeadow Cord Grass	<i>Spartina patens</i>
Needle Grass	<i>Stipa avenacea</i>
Sea Oats	<i>Uniola paniculata</i>
Carolina Laurel Cherry	<i>Prunus caroliniana</i>

APPENDIX D

FORT FISHER HISTORY

Fort Fisher was the largest earthwork fort in the Confederacy. Until the last few months of the Civil War, the fort kept Wilmington open to the blockade-runners, on which the Confederacy relied heavily to supply its armies. The heaviest naval bombardment of land fortifications up to that time took place there on December 24-25, 1864, and January 13-15, 1865. The site of Fort Fisher is preserved as a State Historic Site.

Early Batteries

On April 24, 1861, Captain Charles P. Bolles was ordered to take command of Confederate Point (now Federal Point), the peninsula located north of the entrance into the Cape Fear River called New Inlet. During the next two weeks he supervised the construction of two sand batteries. On May 4 he was transferred and replaced by Captain William DeRosset. Captain DeRosset completed the earthworks and named the most southern work "Battery Bolles." After mounting two 24-pounders, DeRosset was promoted to Major and on May 29, 1861, was transferred.

During the next year, under command of Major John J. Hedrick, additional sand batteries were constructed at Confederate Point. Captain John Winder designed a casemate battery of railroad iron and palmetto logs and Colonel S. L. Fremont designed and erected a casemate revetted at the portholes by palmetto logs. Before Hedrick's transfer, the batteries on Confederate Point were named Fort Fisher in honor of Colonel Charles F. Fisher of Salisbury, who had been killed at the Battle of First Manassas while commanding the Sixth North Carolina Regiment.

By the summer of 1862, Fort Fisher already had its basic shape of an "L". It consisted of a battery of land defense, a quadrilateral field work known as Fort Fisher, and four batteries of sea defense. The fort mounted only 17 guns at that time.

Malakoff of the South

On July 4, 1862, Fort Fisher received a new commander--Colonel William Lamb of Norfolk, Virginia. Before the war Colonel Lamb, son of the Mayor of Norfolk and a law graduate of William and Mary College, was part owner and editor of the Southern Argus. The new commander, in his late twenties, took a sharp look at the works on Confederate Point and observed that "one of the Federal frigates could have cleared it out with a few broadsides." Lamb at once commenced to build a "work of such magnitude that it could withstand the heaviest fire of any guns in the American Navy."

Lamb, as well as the Confederate Government, recognized the importance of protecting New Inlet and keeping the port of Wilmington open to blockade-runners. During the next two and one-half years he designed and constructed the powerful new Fort Fisher, using 500 Negro laborers assisted by the garrison. By the end of 1864 the fort extended from the Cape Fear River all the way across the Peninsula, half a mile, and then south down the beach one mile. It mounted 47



THE BOMBARDMENT OF FORT FISHER, JANUARY 15, 1865. TAKEN FROM LITHOGRAPHS.



FORT FISHER, COMMANDING THE NEW INLET ENTRANCE TO CAPT JEAR RIVER.—THE BRITISH STEAMER "HANSA" RUNNING THE BLOCKADE UNDER THE GUNS OF THE FORT.—[FROM A SKETCH BY AN ENGLISH ARTIST.]

APPENDIX D CONTINUED

FORT FISHER HISTORY

heavy guns and was called the "Malakoff Tower of the South." The "Malakoff Tower" referred to was the Russian redoubt at Sebastopol, which held off the combined land and naval forces of Great Britain and France in the Crimean War.

Unlike earlier forts such as Macon, Caswell, and Sumter, Fort Fisher was built of earth instead of masonry, so that it withstood naval bombardment much more easily. Its construction marked an outstanding innovation in army engineering in this country. For many years after the war, Fort Fisher was regarded as a classic of fort construction and a model was long used at West Point for classroom illustration.

Blockade-Running

Primarily, Fort Fisher deserves its important position in Civil War history for its protection of the port of Wilmington by means of its control over one of the two Cape Fear River approaches. The Confederate steamers preferred New Inlet as their entrance into the Cape Fear River because it was protected by Fort Fisher.

Blockade-runners were designed for speed. They were side-wheelers or double screws, long, low and narrow, nine times longer than wide and from 400 to 700 tons burthen. These swift ships were painted a light gray, to make them as nearly invisible as possible. Funnels could be lowered close to the deck if necessary, and when possible, smokeless coal was used; no lights were permitted.

During the war at least 100 different steamers were engaged in running the blockade into the Cape Fear River, and very few were captured before making at least one round trip. The squadron off Wilmington reported 65 steam blockade-runners captured or destroyed during the war.

The Federals realized early in the war the importance of closing the port of Wilmington and cutting the vital Confederate supply line of provisions, clothing, and munitions of war. They were deferred from this action until a combined army-navy force large enough to capture and occupy the lower Cape Fear River area could be assembled.

First Battle

By the fall of 1864 the Federals were able to begin assembling a joint army-navy expedition to be used against Fort Fisher. When assembled, the Federal forces included 56 warships, plus transports and landing barges, under the command of Rear Admiral David Porter, and an army unit of 6,500 infantrymen under the command of Major General Benjamin F. Butler. To oppose this, the Confederates had 1,430 men in the Fort Fisher garrison and Major General Robert F. Hoke's force of 6,000 veterans from Lee's army five miles up the river at Sugar Loaf.

On the night of December 23, the Federals began their attack by exploding the powder ship Louisiana within 200 yards of the fort. The 215 tons of powder did absolutely no damage. The Federal fleet bombarded the fort on December 24

APPENDIX D CONTINUED

FORT FISHER HISTORY

and 25. On the afternoon of December 25, two thousand troops from Butler's command landed at Battery Anderson three miles up the coast. Advanced Federal skirmishes were halted by the fort's artillery fire and the troops rallying to the palisades. No major damage was done and General Porter decided the fort was too strong to assault. The troops were withdrawn and the fleet sailed December 27 to Beaufort, North Carolina. The Confederates considered that they had won a victory.

Second Battle

On the night of January 12 the Federal fleet reappeared off the ramparts of Fort Fisher. This time Admiral Porter felt that the Federal forces would be victorious for General U. S. Grant had replaced Butler with a fighting general, Major General Alfred H. Terry, and had increased the army units to 8,000 troops.

On the morning of January 13, the five ironclads closed in on the fort land, concentrating their fire on the land defense, and began their bombardment. The Federal fleet now numbered 58 warships mounting 627 guns. At the same time, the Federal infantry landed three miles up the beach. The fort answered the Federal bombardment with a slow but determined fire. The fleet continued to shell the fort day and night from the 13th to the 15th.

Meanwhile, the infantry moved across the peninsula at a point three miles north of Fort Fisher and entrenched during the 14th. Light artillery was landed and emplaced. Leaving 4,700 men in these entrenchments to hold off General Braxton Bragg's 6,000 Confederates coming from Wilmington to relieve the fort, General Terry moved 3,300 men against Fort Fisher. Bragg's men took no part in the engagement which followed.

On the afternoon of January 15, at the pre-arranged hour of three, Terry's three brigades assaulted the land defense at the river's edge. Four hundred Federal marines and 1,600 sailors armed with pistols and cutlass attacked the full bastion on the beach side in the face of a heavy and concentrated fire from the fort. After sustaining a heavy loss, the sailors and marines retreated in disorder.

The attack on the full bastion served as a decoy and enabled the Federal infantry attacking on the river side to break into the fort. Once inside, the men fought in bloody hand-to-hand combat for possession of the traverses. During this action General Whiting was mortally wounded and Colonel Lamb severely wounded. The firing continued well into the night and finally at ten o'clock 1,500 Confederates surrendered at Battery Buchanan. Federal casualties numbered about 1,300 but the expedition had been successful. The Cape Fear was open to the Federal fleet and Wilmington's blockade-running days were over.

Aftermath

The Confederates evacuated the lower Cape Fear defenses after the fall of Fort Fisher and concentrated their troops and guns at Fort Anderson, a large earth fortification at the site of the extinct colonial town of Brunswick, on

APPENDIX D CONTINUED

FORT FISHER HISTORY

the west bank of the river, in a last stand to protect Wilmington. The Federal fleet moved into the Cape Fear River, while land units marched up both sides of the river. Fort Anderson fell on February 19, following a combined naval and land assault, and Wilmington, the capitol of Confederate blockade-runners, was evacuated on February 21.

APPENDIX E

GLOSSARY OF TERMS

Bureau of Outdoor Recreation Classes:

- BOR Class I - High Density Recreation Areas
Intensive development and recreation activities such as group sports. Usually within or near major urban populations.
- BOR Class II - General Outdoor Recreation Areas
Generally less intensive and more remote than Class I areas. Interesting and attractive setting for activities such as camping, nature walks and outdoor sports.
- BOR Class III - Natural Environment Areas
Weekend and vacation activities dependent on natural setting such as nature study, sightseeing, hunting and fishing. Light facility development, access, trails and campsites.
- BOR Class IV - Outstanding (Unique) Nature Areas
Outstanding nature features that merit special attention and preservation. Activities limited to those that preserve the setting. Minimum development outside the immediate area of the unique features.
- BOR Class V - Primitive Areas
Wild and undeveloped areas removed from the effects of civilization. Activities limited to those requiring a minimum of convenience and equipment. No development of recreational facilities except trails.
- BOR Class VI - Historic and Cultural Sites
Sites associated with history, tradition or cultural heritage that merit preservation or restoration. Activities such as sightseeing and study of features. Development not to detract from value of site.

Aquifer	A water-bearing stratum of permeable rock, sand, or gravel.
Barrier Island	A detached portion of a bar whose crest rises above high water, runs parallel to the shore, and is normally situated between two inlets.
Deltaic Ridge	A ridge forming a delta.
Ecotype	A specific ecological community.
Estuary	That part of a water system which meets the sea's tides and is subject to their effects.
Federal Point	The entire land mass or island south of Carolina Beach Inlet.

APPENDIX E CONTINUED

GLOSSARY OF TERMS

Groin Structures	Breakwater type barriers which absorb the force of the waves in order to protect the beach.
Littoral Drift	Movement of sand parallel to the shoreline caused by wave action.
Monoclinal Dip	A land formation which slopes or dips in only one direction.
Quaternary (Pleistocene) Age	The series of the most recent geological period (Quaternary) that follows Pliocene and precedes Recent in age.

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CREDITS

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